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APPENDIX TO THE JOURNALS

OF THE

SENATE AND ASSEMBLY

OF THE

THIRTY-SECOND SESSION

OF THE

LEGISLATURE OF THE STATE OF CALIFORNIA.

VOLUME V.

SACRAMENTO:
A. J. JOHNSTON, : : : : SUPERINTENDENT STATE PRINTING.
1897.

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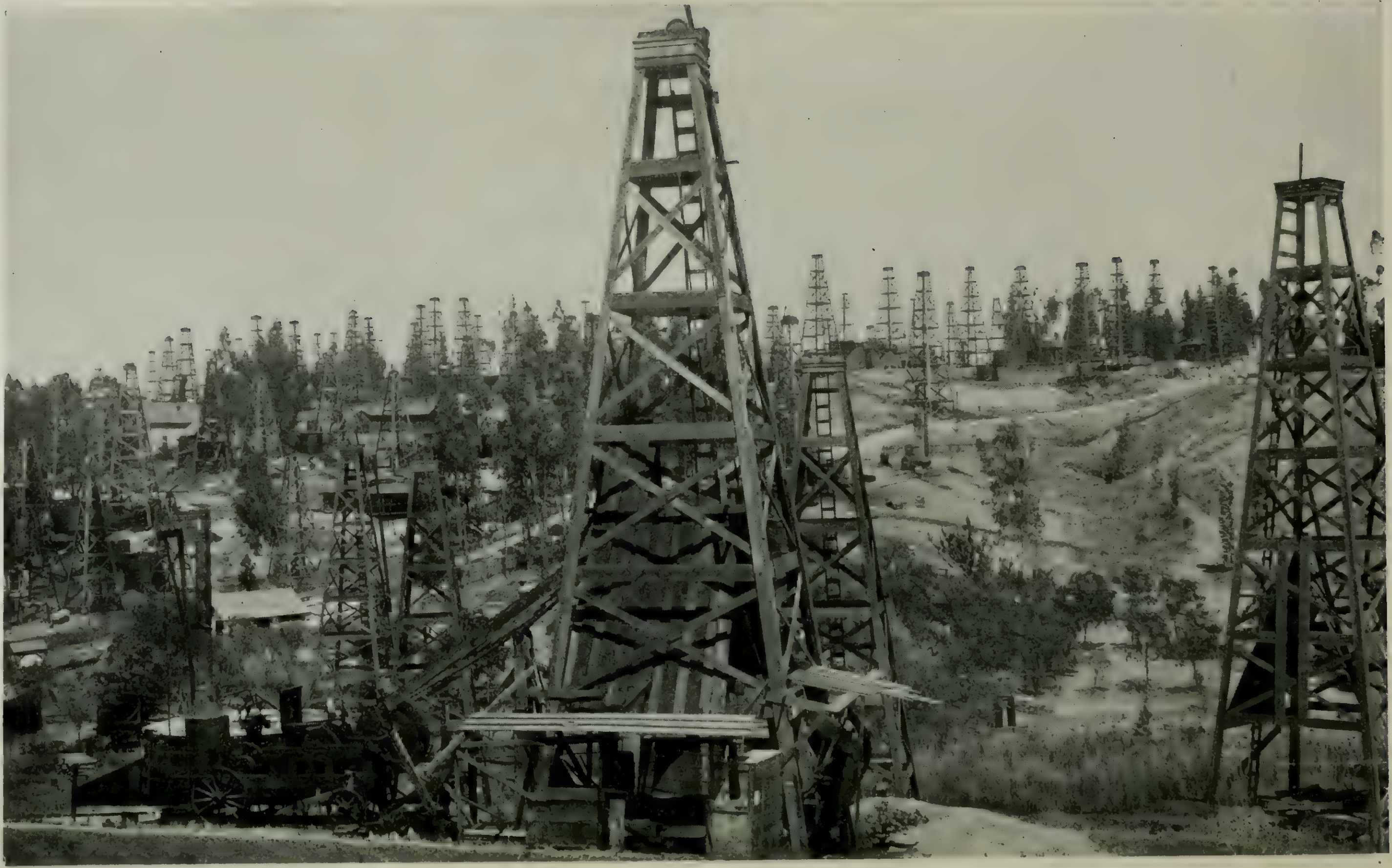
CONTENTS.

1—Biennial Report of the State Mineralogist. 1894–1896.
2—Biennial Report of the Board of Horticulture. 1894–1896.
3—Biennial Report of the Trustees of State Normal School, San José. 1894–1896.
4—Biennial Report of the Trustees of State Normal School, Los Angeles. 1894–1896
5—Biennial Report of the Trustees of State Normal School, Chico. 1894–1896.
6—Biennial Report of Commissioners to manage Yosemite Valley. 1894–1896.
7—Annual Report of Board of Park Commissioners at San Francisco. 1894–1895
8—Annual Report of Board of Park Commissioners at San Francisco. 1895–1896.
9—Biennial Report of Debris Commissioner. 1894–1896.
10—Biennial Report of Trustees of the Mineral Cabinet. 1894–1896.
11—Biennial Report of State Board of Harbor Commissioners. 1894–1896.
12—Biennial Report of State Board of Harbor Commissioners for the Bay of San Diego. 1894–1896.



Oil Wells in Los Angeles City.

CALIFORNIA STATE MINING BUREAU.

J. J. CRAWFORD, State Mineralogist.

THIRTEENTH REPORT

(THIRD BIENNIAL)

OF THE

STATE MINERALOGIST

FOR THE

TWO YEARS ENDING SEPTEMBER 15, 1896.

SACRAMENTO:
A. J. JOHNSTON, : : : : : : SUPERINTENDENT STATE PRINTING.
1896.

In Memoriam.

HON. JACOB ZIGLER DAVIS,

Died October 28, 1896,

IN PHILADELPHIA, PA.

At the regular meeting of the Board of Trustees of the California State Mining Bureau, held in the City of San Francisco, State of California, November 5, 1896, the following resolutions were unanimously adopted, ordered spread upon the minutes, and inserted in our forthcoming XIIIth Report:

Whereas, It has pleased an all-wise Providence to remove from our midst our esteemed friend and coadjutor, the Hon. Jacob Zigler Davis, for many years the faithful, zealous, and untiring President of the California State Mining Bureau; now, therefore, be it

Resolved, That by reason of his sudden demise we have lost an invaluable associate, and our State and city have been deprived of the unselfish and freely-given services of the best friend our institution has ever possessed. His purse was open to supplement our appropriation whenever needed. He has enriched our collection with many priceless specimens of metals, ores, and minerals, as well as with many very interesting curios, valuable relics, and works of art. His whole heart was wrapped up in the success of our Museum. We leave to other beneficiaries of his generosity the pleasing duty of reciting his many acts of charity and open-handed largess.

We cordially indorse the expression of one who, in life, knew him most intimately, that "he was the best rich man in the City of San Francisco."

Resolved further, That as a last fitting act of respect to the memory of our late associate, the office of President of our Board remain vacant until his term would have expired, for in very truth we know of no man who can replace him.

(Signed:) W. S. KEYES,
T. B. BISHOP,
W. S. LYLE,
J. E. DOOLITTLE,
Trustees.

TABLE OF CONTENTS.

[NOTE.—This report is so arranged that the subjects follow each other in alphabetical order. Under each subject-head the counties and mines also follow in alphabetical order. A detailed index is therefore unnecessary.]

PAGE.
LETTER OF TRANSMITTAL 1
REPORT OF BOARD OF TRUSTEES 3–9
REPORT OF STATE MINERALOGIST 10–30

ANTIMONY—

- Kern County 31
- Riverside County 31

ARGENTIFEROUS GALENA—

- Inyo County 32–33
- Orange County 33
- San Bernardino County 33–34
- Siskiyou County 34

ASPHALT AND BITUMINOUS ROCK—

- Kern County 35–36
- Marin County 36
- Mendocino County 36
- Monterey County 36
- San Luis Obispo County 37–38
- Santa Barbara County 38–42
- Santa Clara County 43
- Santa Cruz County 43–44
- Ventura County 44–45

BORAX—

- Inyo County 46
- Lake County 46
- San Bernardino County 46–47

CHROMIC IRON—

- Alameda County 48
- Calaveras County 48
- Del Norte County 48
- Fresno County 49
- Mendocino County 49
- Napa County 49
- San Luis Obispo County 49
- Santa Clara County 49
- Shasta County 50
- Sierra County 50
- Sonoma County 50
- Tehama County 50

COAL—

- Alameda County 51
- Amador County 51
- Contra Costa County 51–52
- Del Norte County 52
- Fresno County 53

COAL—*Continued.*

	Page.
Humboldt County	53
Los Angeles County	54
Mendocino County	54
Monterey County	54
Riverside County	54
San Benito County	54–55
Shasta County	55
Siskiyou County	55
Sonoma County	55
Sutter County	56
Trinity County	57
COPPER—	
Amador County	57
Calaveras County	57
Del Norte County	57–58
El Dorado County	58
Fresno County	58
Humboldt County	59
Madera County	59
Marin County	59
Mendocino County	59
Nevada County	60
Plumas County	60
Riverside County	60
San Bernardino County	60–61
Shasta County	61–63
Sierra County	63
Siskiyou County	64
Trinity County	64
Tulare County	64
GOLD—	
Yearly production, 1848 to 1896	64
Alameda County	65
Amador County	65–81
Butte County	82–95
Calaveras County	96–125
Colusa County	126
Del Norte County	126–130
El Dorado County	131–165
Fresno County	165–171
Humboldt County	172–179
Inyo County	179–185
Kern County	185–199
Lassen County	200–202
Los Angeles County	203–205
Madera County	205–215
Mariposa County	216–225
Mendocino County	226
Mono County	226–233
Monterey County	234
Napa County	234
Nevada County	234–271
Orange County	272
Placer County	272–287
Plumas County	287–310
Riverside County	310–315
Sacramento County	316–318

GOLD—*Continued.*

	PAGE.
San Benito County	318–319
San Bernardino County	319–330
San Diego County	331–347
San Luis Obispo County	348
Santa Barbara County	348
Santa Cruz County	348–349
Shasta County	349–370
Sierra County	371–385
Siskiyou County	386–435
Sonoma County	436
Sutter County	436
Trinity County	437–468
Tulare County	469–472
Tuolumne County	472–496
Ventura County	497–498
Yuba County	499–503

GYPSUM—

Fresno County	503
Kings County	503
Los Angeles County	504
San Benito County	504

IRON—

Del Norte County	504
Humboldt County	504
Napa County	504
Shasta County	504

MAGNESITE—

Fresno County	505
Napa County	505
Santa Clara County	505
Tulare County	505

MANGANESE—

Alameda County	506
Del Norte County	506
Marin County	506
San Joaquin County	507
Santa Clara County	507
Sonoma County	507

MINERAL SPRINGS—

Alameda County	508
Alpine County	508
Butte County	508
Colusa County	509
Contra Costa County	509–510
Fresno County	510
Humboldt County	510
Inyo County	510–511
Lake County	511
Lassen County	512
Marin County	512
Mendocino County	512–513
Mono County	513
Monterey County	513–514
Napa County	514–515
Plumas County	515
San Benito County	516
San Luis Obispo County	516–517

MINERAL SPRINGS—*Continued.* PAGE.

Santa Barbara County 517
Santa Clara County 517–519
Santa Cruz County 519
Shasta County 519–520
Sierra County 520
Siskiyou County 520–521
Solano County 521
Sonoma County 521–522
Tehama County 522–523
Trinity County 523
Ventura County 524

MINING AND IRRIGATING DITCHES, ARTESIAN WELLS, ETC.—

Alameda County 525–526
Amador County 526
Butte County 526–527
Calaveras County 527–528
Colusa County 528
Contra Costa County 528
El Dorado County 528–531
Fresno County 531–533
Glenn County 533–534
Kern County 534–535
Kings County 536
Los Angeles County 537–538
Madera County 538–539
Merced County 539–542
Mono County 542
Monterey County 543
Nevada County 543–546
Placer County 546–547
Plumas County 547
Sacramento County 547, 548
San Benito County 548–549
San Diego County 550
San Francisco County 550–551
San Joaquin County 551–552
Santa Barbara County 552
Santa Clara County 552–556
Santa Cruz County 557
Shasta County 557
Solano County 558
Stanislaus County 558–559
Sutter County 559
Tehama County 559–560
Trinity County 560–561
Tulare County 561–562
Tuolumne County 562
Ventura County 563–564
Yolo County 565
Yuba County 565

NATURAL GAS—

Kings County 567
Marin County 567
Sacramento County 567
San Joaquin County 567–568
Santa Barbara County 568–569
Santa Clara County 569

NATURAL GAS—*Continued.* PAGE.

Solano County 569
Tulare County 569

PETROLEUM—

Alameda County 570
Colusa County 570–571
Contra Costa County 571
Fresno County 571–572
Los Angeles County 572–582
Napa County 582
Santa Barbara County 582–584
Santa Clara County 585
Santa Cruz County 585
Ventura County 585–593

QUICKSILVER—

Colusa County 594
Lake County 595–597
Napa County 597–599
San Benito County 599–600
San Luis Obispo County 600
Santa Clara County 600–601
Siskiyou County 602
Sonoma County 602–603
Stanislaus County 603
Trinity County 603–604
Yolo County 604

SILVER—

Inyo County—See Argentiferous Galena 605
Kern County 605
Napa County 606
San Bernardino County 606–609
San Mateo County 610
Shasta County 610
Tulare County 610

STRUCTURAL MATERIALS—

Basalt—Napa County 612
Cement—San Bernardino County 612
Solano County 612
Clay, Brick, Pottery, Etc.—Alameda County 612–613
Amador County 613
Butte County 614
Contra Costa County 614
Kern County 614
Los Angeles County 614–615
Marin County 615
Mono County 616
Placer County 616
Riverside County 616–617
Sacramento 617
San Joaquin County 617–618
San Luis Obispo County 618
Santa Clara County 618
Santa Cruz County 619
Shasta County 619
Solano County 619
Tulare County 620
Granite—Madera County 620
Nevada County 620

STRUCTURAL MATERIALS—Granite—*Continued.* PAGE.

Placer County 620–622
San Bernardino County 622
San Diego County 623
San Luis Obispo County 623
Shasta County 623
Trinity County 623
Tulare County 623
Macadam—Alameda County 624
Los Angeles County 624
Marin County 625
Sacramento County 625
San Francisco County 625–626
Santa Clara County 626
Shasta County 626
Solano County 627
Sonoma County 627
Marble, Limestone, and Lime—Amador County 627
Calaveras County 627
Contra Costa County 628
El Dorado County 628
Fresno County 628
Inyo County 628
Kern County 628–629
Lake County 629
Los Angeles County 629
Madera County 629
Mariposa County 629
Mono County 629
Monterey County 629
Napa County 629
San Benito County 629–630
San Bernardino County 630
Santa Clara County 630
Santa Cruz County 631–632
Shasta County 632
Siskiyou County 632
Solano County 632
Sonoma County 633
Trinity County 633
Tulare County 633
Tuolumne County 633
Paving-Blocks—Marin County 633
Napa County 633
Solano County 634
Sonoma County 634–635
Sandstone—Alameda County 635
Colusa County 635
Contra Costa County 635–636
Del Norte County 636
Humboldt County 636
Mendocino County 636
Monterey County 636
Napa County 636
San Luis Obispo County 637
Santa Barbara County 637
Santa Clara County 637
Shasta County 637–638
Sonoma County 638

STRUCTURAL MATERIALS—Sandstone—*Continued.* Page.

Ventura County 638
Yolo County 638
Slate—El Dorado County 639
Steatite and Serpentine—El Dorado County 639
Los Angeles County 639
Napa County 639
Riverside County 639
Trachyte, Tuff, Etc.—Napa County 640
Sonoma County 640
Yolo County 640
Travertine and Onyx—Mendocino County 640
Mono County 640
San Luis Obispo County 641
Sonoma County 641
Yolo County 641

MISCELLANEOUS—

Asbestos—Riverside County 642
Chrysoprase—Tulare County 642
Diamonds—El Dorado County 642
French Chalk (Steatite)—Los Angeles County 642
Graphite—Fresno County 642
Infusorial Earth—Los Angeles County 643
Mineral Paint—Sonoma County 643
Platinum—Del Norte County 643
Humboldt County 643
Plumas County 643
Trinity County 644
Salt—Alameda County 644–645
Riverside County 645
San Bernardino County 645–646
Shasta County 646
Soda—Inyo County 646
Sulphur—Lake County 646
Zinc—Shasta County 646

APPENDIX—

Preservation of Structural Timber; by John D. Isaacs 647–655
Petroleum: Its Origin in California,—Its Composition and Chemical Nature,—Properties of Various Crude Oils,—Manufactured Products by Refining,—Etc.; by F. Salathè, Ph.D. 656–661
Oil as Fuel in Los Angeles County; by W. L. Watts 662–664
Ore Deposits, with Special Reference to the Mother Lode; by Harold W. Fairbanks, Ph.D. 665–672
Electric-Power Transmission Plants in California; by W. F. C. Hasson 673–678
The Sampling and Measurement of Ore-Bodies in Mine Examinations; by Edmund B. Kirby 679–700
Comstock Ore-Sampling; by John D. McGillivray 701–705
A Water-Power and Compressed-Air Transmission Plant; by Arthur De Wint Foote 706–720
The Coming Motive Power; from the "Inventive Age" 721–725
A Congressional Act appropriating $250,000 "for the construction, repair, preservation of certain public works on rivers and harbors, and for other purposes" 726

LIST OF ILLUSTRATIONS.

Page.

Alma Mine, Section of, Amador County 67
Alta Drift Mine, Plan of, Placer County 273
Alturas Mine Tailings Works, Plumas County 287
American River, Three views below Folsom Dam, Sacramento County 673
Arrastra (Double), Elevation and Plan of, Commodore Mine, Siskiyou County 394
Arrastra, Georgia Mine, Inyo County 181
Artesian Well, Heminghaus', Fresno County 532
Artesian Well, Miramonte Colony, Kern County 532
Asphalt Deposits, Sisquoc Grant, Santa Barbara County. (3 cuts) 41–42
Balakalala Copper Mines, Shasta County 62
Bituminous Rock Quarry, City Improvement Company, Santa Cruz County 44
Blue Gouge Mine, Section of, El Dorado County 135
Burnettizing Plant, Portable 651
Champion Mine, Nevada County 239
Compressed-Air Transmission, by Foote. (3 cuts) 709–715–716
Compressor-House, North Star Mine, Nevada County 706
Connection of Turbines and Generators at Folsom Power-House 674
Conveyor Reels, Cie Français de Hydraulic, Trinity County 443
Current Wheels, Bennet River Mine, Siskiyou County 388
Current Wheels, Brady Mine, Scott River, Siskiyou County 388
Dam in Yuba River, Nevada County Electric Company's 676
Diestelhorst Dredger, Shasta County 354
Elevation of Canal, Forebay, and Power-House, Folsom, Sacramento County 675
Eureka Company's Quarry, Rocklin, Placer County 622
Flume Tunnel, Cie Française de Hydraulic, Trinity County 443
Furnace of Mirabel Quicksilver Mine, Lake County 596
Generator Room, Folsom Power-House 674
Geological Sections (2) of the Los Angeles Oil Field 573
Gold Chief Mine, Section of New York Mountains, San Bernardino County 322
Good Hope Mine, Riverside County 311
Goodrich Sandstone Quarry, Santa Clara County 635
Great Eastern Quicksilver Mine, Sonoma County 602
Great Western Quicksilver Mine, Lake County 396
Holcomb Valley Mine, Use of Steam Shovel at, San Bernardino County 323
Idlewild Mine, Tailings Sampler, El Dorado County 146
Interior of Power-House, Nevada County Electric Company. (2 cuts) 676
Interior of Power-House, San Joaquin Electric Company 676
Interior of Sub-station, San Joaquin Electric Company 676
Irrigation Section of Ventura County 564
Jacoby Sandstone Quarry, Humboldt County 636
Manhattan Quicksilver Mine, Napa County 598
Map of Mother Lode Belt in El Dorado County 131
Map of Nevada County Electric Company's Lines 676
Mineral Paint Works, Sonoma County 643
Oil Wells in Los Angeles City Frontispiece.
Olympus Mine, Kern County 194
Onyx Mine, Sonoma County 643
Ordinary Tom, Union Mine, Humboldt County 175
Ore Drier at Great Eastern Quicksilver Mine, Sonoma County 602
Oregon Tom, Union Mine, Humboldt County 175

PAGE.
Pelton Wheel Mountings, etc., San Joaquin Electric Company 676
Pipe-Line, etc., San Joaquin Electric Company 676
Plan of Canal, Forebay, and Power-House, Folsom, Sacramento County 674
Plan of Folsom Dam, Sacramento County 673
Power-House, Nevada Electric Company 676
Power-House, San Joaquin Electric Company 676
Providence Mine, Nevada County 260
Randsburg, Kern County 194
Redington Quicksilver Mine, Napa County 598
Rock Conveyor, Cie Français de Hydraulic, Trinity County 445
Rocklin Granite Company's Quarry, Placer County 622
Royal Rock Mine, San Bernardino County 523
Sampling and Measuring Ore-Bodies. (13 cuts) 688, 690, 691, 692, 693, 695, 696
San Luis Chrome Works, Exterior View, San Luis Obispo County 49
San Luis Chrome Works, Interior View, San Luis Obispo County 49
Santa Rosa Mine, Riverside County 311
Sites Sandstone Quarry, Colusa County 635
State-Power House at Folsom 674
Steel-Capped Riffle Bars, designed by J. B. Hobson, Placer County 453
Texas Consolidated Mine, Section of, Shasta County 366
Toms, Humboldt County. (2 cuts) 175
Uncle Sam Mine, Shasta County 367
Water-Blast, Ventura County 587

To his Excellency JAMES H. BUDD, *Governor of California:*

SIR: The Trustees of the State Mining Bureau herewith submit their report, in pursuance of the Act of the Legislature approved March 23, 1893, entitled "An Act to provide for the establishment, maintenance, and support of a bureau, to be known as the State Mining Bureau, and for the appointment and duties of a Board of Trustees, to be known as the Board of Trustees of the State Mining Bureau, who shall have the direction, management, and control of said State Mining Bureau, and to provide for the appointment, duties, and compensation of a State Mineralogist, who shall perform the duties of his office, under the control, direction, and supervision of the Board of Trustees of the State Mining Bureau."

J. Z. DAVIS.
W. S. KEYES.
THOMAS B. BISHOP.
W. S. LYLE.
J. E. DOOLITTLE.

SAN FRANCISCO, September, 1896.

REPORT

OF

TRUSTEES OF STATE MINING BUREAU.

The Trustees, in presenting herewith the Third Biennial or XIIIth Report of the State Mineralogist, take pleasure in commending the unity of purpose and painstaking industry of the State Mineralogist and his assistants, both in the field and in the office. And they further commend the good sense and self-sacrifice of the field men in willingly submitting to a curtailing of their remuneration in the final months of the last fiscal year, in order that the Bureau might "live within its income" and avoid the necessity of appealing to the Legislature to make up a deficiency. The Board also desires to mention the good work done by Mr. F. W. Lees, License Collector of San Francisco, who for the quarter ending September 30, 1896, collected the sum of $1,152 35 from the tax on stock certificates for the benefit of the Mining Bureau Fund, and to suggest that if the County Tax Collectors would do likewise the Bureau would be in a position to accomplish more work.

MUSEUM.

In pursuance of the plan, adopted two years ago, to restrict the exhibits in the Museum to such material only as may serve to display the mineral resources of the State, it has been deemed wise to turn over to the Park Museum, in the City and County of San Francisco, certain Eskimo and Indian curios.

The space thus gained—four entire floor cases and one complete upright set of shelves—has enabled the Curator of the Museum to display quite a number of the specimens of ores, earths, and minerals collected by the field assistants and donated by individuals. The upright set of shelves has been entirely filled with a full set of typical wall and other rocks, illustrating the geology of the so-called great "Mother Lode" of the State. This series of rocks was collected by field assistant Harold W. Fairbanks. We venture the assertion that this exhibit is unique of its kind, is very nearly exhaustive, and is well worthy of close examination and study.

The continued popularity of the Museum is shown by the number of names registered, viz., 54,478, in the last two years. Included in this total we find the names of 572 pupils of our public schools.

There have been added to the catalogue, and properly labeled, 657 exhibits, not including the 500 rock samples collected by Assistant Fairbanks.

Since the publication of the last report, there have been added to the Museum a large number of attractive and useful exhibits. Among these we may mention a miniature duplicate of a ten-stamp gold mill, built upon a scale of one inch to the foot. This model, including engine, engine-house, shaft of the mine, and shaft-house, covers a space 12½'x 2½'. The Bureau is indebted for this extremely practical exhibit to the President of the Board, Mr. J. Z. Davis, who has still further evinced his interest in the Museum by contributing some 125 choice minerals.

It would require a large amount of space to mention all the donations received, and the Board of Trustees must, perforce, content itself with hereby publicly thanking these friends of our institution. Without intending to show any invidious distinctions, the Trustees venture to call attention to the following contributions, viz.: A remarkable specimen of stalactitic limonite, from Mr. Charles Camden, of Shasta County; a large relief map of Sierra County, from the Sierra County Miners' Association; crystallized cinnabar, from the Altoona Quicksilver Mining Co.; and a number of very characteristic and valuable specimens of calcareous alabaster (Mexican onyx) and variegated marbles, from Mr. A. L. Seager.

The Trustees acknowledge, with thanks to the Placer County Miners' Association, the gift of four showcases used at the Midwinter Fair held in this city in 1893.

The Trustees are pleased to recognize the increase to our collections through valuable interchanges of specimens with the U. S. National Museum at Washington, D. C.; with the School of Mines of Colorado; with the Perak Museum of the Straits Settlements; with the Department of Mines of New South Wales, etc.

LABORATORY.

Since the publication of the last report there have been received and answered 884 letters of inquiry, and with them have come 1,571 packages of ores and rocks.

There have called for information in person, 563 individuals, who have brought with them 798 packages of minerals. All have been answered. In addition, the Laboratory has furnished 22 analyses of coals and 8 qualitative analyses of water.

LIBRARY.

There have been added to the Library by purchase, since the last report, only fourteen volumes, for the reason that the Trustees have deemed it wise to expend the small available funds for other purposes. Considerable additions have, however, been made from placing upon the shelves many of the publications of the General Government, as well as the geological reports of other States, besides monographs, bulletins, etc., from numerous scientific bodies and associations, both domestic and foreign. The sum total of the bound volumes in the Library now amounts to the respectable number of 4,400.

The Librarian has, during the last two years, distributed through the mail and otherwise, more than 8,000 copies of the Reports of the State Mineralogist, and over 25,000 maps and bulletins. He has, also, during the same period of time, written some 11,000 letters in reply to inquiring citizens asking information as to matters touching the metallurgical, the mineral, and kindred resources of our State.

That the Library continues in popularity is shown by the fact that an average of over 1,000 visitors per month have availed themselves of the printed information borne upon its shelves.

FACILITIES FOR RECEIVING SPECIMENS.

The Trustees desire again to express the thanks of themselves and the public of our State to Wells, Fargo & Co., and the Oceanic Steamship Company, for the free transportation of specimens and exhibits directed to the Bureau.

LIST OF DONORS.

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Mack, P. H.
Madeira, Geo.
Mason, W. Q.
Mast, Chas. L.
Mayflower Mining Co. of Nevada City.
Mendenhall, A.
Moore, Albert
Morongo King Mining Co.
Mott, Frank
Mt. Leyshon Mining Co., Ltd.
Nier, J. W.
Noble, Thos. & Sons
Oldham, Louis
Orear, H. W.
Parrett, J.
Pattee, Solon
Perry, Mrs. J. W. S.
Pierson, J. W.
Pratt, E. B.
Quin, T. C.
Quinby, W. C.
Rabe, Dr. John
Rathbun, J. P.
Rhodes, M. G.
Rice Bros.
Robinson, A. J.
Root, W. C.
Rostel, C. B.
Saladin, E.
Sanders, T. B.
Scott, Ira A.
Scott, J. A.
Scupham, J. R.
Seager, A. L.
Shenandoah Gold Mining Co.
Shepard, A. D.
Shooter, T.
Sierra County Miners' Ass'n
Sierra Gold Mining Co.
Skinner, Mr.
Smith, E. E.
Smith, Capt. Oliver
Standart, G.
Stanley, J. P.
Stewart, John
Stockwell, H. E.
Stone, D. C.
Storch, J. B.
Storey, G.
Storms, W. H.
Stow, W. W.
Taylor, S. S.
Theisen, John
Tomlinson, E. H.
Thomas, B. S.
Thomas, W. P.
Traphagen, F. W.
Trenschel, A. F.

Tourtellotte, Mrs.
Veatch, J. A.
Violetti, G.
Voorheis, E. C.
Waldron, C.
Walker, W.
White, J. S.
Whitney, W.
Willis, G. F.
Williams, Benjamin
Williams & Tong
Williamson, Mrs. M. B.
Winter, L. H.
Wolcott, John R.
Womble, Alex. M.
Yates, Dr. L. G.
Yeaw, W. E.
Young, Mrs. J.
Young, N. J.
Young, T. M.
Yerington, J. A.
Zachert, J.

STATE BOARD OF TRADE—ATLANTA EXPOSITION.

A typical and extensive exhibit of the rocks, ores, earths, and minerals of our State was, in April of the present year, supplied by the Curator of the Museum to the State Board of Trade, which may be seen at their rooms, No. 16 Post Street, in this city.

A comprehensive exhibit of minerals and ores was, upon request of the Georgia State Board of Trade, forwarded to Atlanta, Ga., to be displayed at the Industrial Exposition held in that city in the latter part of last year. After the close of the exhibition, the contribution was, by order of the Board of Trustees, presented to the Georgia Normal and Industrial Institute at Milledgeville, the capital, where it will be permanently open to public inspection.

LIST OF NEWSPAPERS RECEIVED IN EXCHANGE.

We are greatly obliged to the editors and publishers for the following papers, which have been forwarded free to the Bureau during the last two years:

Name of Paper.	Place of Publication.	State.
Amador Dispatch	Jackson, Amador County	California.
Anaheim Gazette	Anaheim	California.
Arroyo Grande Herald	Arroyo Grande	California.
Alameda Encinal	Alameda	California.
Adin Argus	Adin, Modoc County	California.
Amador Ledger	Jackson, Amador County	California.
Angels Voice	Angels, Calaveras County	California.
Amador Record	Sutter Creek	California.
Blue Lake Advocate	Blue Lake, Humboldt County	California.
Bullion	Los Angeles	California.
Burney Valley Bulletin	Burney Valley, Shasta County	California.
Berkeley Daily Advocate	Berkeley	California.
Californian	Bakersfield	California.
Calaveras Citizen	San Andreas	California.
Calaveras Chronicle	Mokelumne Hill	California.
Calaveras Prospect	San Andreas	California.
Chino Valley Champion	Chino	California.
Citrograph	Redlands	California.
Cloverdale Reveille	Cloverdale	California.
Contra Costa Democrat	Martinez	California.
Contra Costa Gazette	Martinez	California.
Corning Observer	Corning	California.
Colfax Sentinel	Colfax	California.
Colusa Sun	Colusa	California.
Commercial Bulletin	Los Angeles	California.
Colton Chronicle	Colton	California.
Central Californian	San Miguel	California.
California Voice	Los Angeles	California.
Daily Tidings	Grass Valley	California.
Del Norte Record	Crescent City	California.
Democratic Banner	Sonora	California.
Dixon Tribune	Dixon	California.
Dispatch-Democrat	Ukiah	California.
Dunsmuir News	Dunsmuir	California.
Escondido Times	Escondido	California.
Express	Los Angeles	California.
Eureka Sentinel	Eureka	California.

Name of Paper.	Place of Publication.	State.
Evening Herald	Nevada City	California.
El Dorado Republican	Placerville	California.
Eel River Valley Advocate	Fortuna, Humboldt County	California.
Fresno County Enterprise	Selma	California.
Fresno Expositor	Fresno	California.
Fresno Republican	Fresno	California.
Free Lance	Hollister	California.
Four Corners	Wheatland	California.
Free Press	Redding	California.
Gilroy Gazette	Gilroy	California.
Globe Review		
Gridley Herald	Gridley	California.
Georgetown Gazette	Georgetown	California.
Humboldt Times	Eureka	California.
Humboldt Standard	Eureka	California.
Herald-Democrat	Leadville	Colorado.
Herald, The	Dunsmuir	California.
Independent Calistogan	Calistoga	California.
Inyo Register	Bishop	California.
Ione Valley Echo	Ione City, Amador County	California.
Inyo Independent	Independence	California.
Investor, The	Los Angeles	California.
Lassen Advocate	Susanville	California.
Loomiston Journal	Loomiston	Washington.
Livermore Herald	Livermore	California.
Los Baños Enterprise	Los Baños	California.
Los Gatos Chronicle	Los Gatos	California.
Madera Mercury	Madera	California.
Mining Industry	Denver	Colorado.
Mining News Era	Forbestown	California.
Mining and Metallurgical Journal	Los Angeles	California.
Morning Press	Santa Barbara	California.
Mining Standard	Sydney	New South Wales.
Middletown Independent	Middletown	California.
Mountain Messenger	Downieville	California.
Monterey Cypress	Monterey	California.
Mountain Democrat	Placerville	California.
Mariposa Gazette	Mariposa	California.
Mining Review	Spokane	Washington.
Mining Review	Ontario	Canada.
National City Record	San Diego	California.
Napa Register	Napa City	California.
New Era	Perris	California.
Nevada Evening News	Nevada City	California.
Nevada Transcript	Nevada City	California.
New North West	Deer Lodge	Montana.
Newcastle News	Newcastle	California.
Nevada Evening Herald	Nevada City	California.
Nevada State Journal	Reno	Nevada.
News, The	Pasadena	California.
Nugget, The	Placerville	California.
Oakdale Graphic	Oakdale	California.
Oakland Enquirer	Oakland	California.
Oakland Tribune	Oakland	California.
Ontario Record	San Bernardino	California.
Oroville Mercury	Oroville	California.
Oroville Register	Oroville	California.
Pacific Tree and Vine	San José	California.
Petaluma Courier	Petaluma	California.
Petaluma Weekly Argus	Petaluma	California.
Pleasanton Times	Pleasanton	California.
Placer Argus	Auburn	California.
Placer Herald	Auburn	California.
Placer County Republican	Auburn	California.
Pacific Northwest, The	Portland	Oregon.
Press and Agriculturist	Riverside	California.
Plumas National Bulletin	Quincy	California.
Porterville Enterprise	Porterville	California.
Redwood City Democrat	Redwood City	California.
Salinas Democrat	Salinas	California.
Standard and Diggers News	Johannesburg	South Africa.
Salt Lake Tribune	Salt Lake City	Utah.
Santa Cruz Surf	Santa Cruz	California.
Santa Ynez Argus	Santa Ynez	California.

Name of Paper.	Place of Publication.	State.
San Luis Obispo Tribune	San Luis Obispo	California.
San José Herald	San José	California.
San Benito Advance	Hollister	California.
Santa Maria Times	Santa Maria	California.
Santa Clara Journal	Santa Clara	California.
Selma Irrigator	Selma	California.
Sacramento River News	Rio Vista	California.
Sonoma County Tribune	Healdsburg	California.
Sonoma Democrat	Santa Rosa	California.
Sierra Valley Record	Sierra Valley	California.
Stockton Record	Stockton	California.
Stockton Mail	Stockton	California.
Stockton Independent	Stockton	California.
St. Helena Star	St. Helena	California.
Stanislaus Weekly Record	Modesto	California.
Sutter Independent	Yuba City	California.
Sutter County Farmer	Yuba City	California.
Shasta Weekly Courier	Shasta City	California.
Santa Rosa Republican	Santa Rosa	California.
Star	Pasadena	California.
Searchlight	Redding	California.
Town and Country	Sydney	Australia.
Tulare County Times	Visalia	California.
Tulare Register	Visalia	California.
The Architect	San Francisco	California.
Union Democrat	Sonoma	California.
Union, The	San Diego	California.
Vacaville Reporter	Vacaville	California.
Valley Record	Ashland	Oregon.
Ventura Free Press	Ventura	California.
Virginia Chronicle	Virginia City	Nevada.
Visalia Delta	Visalia	California.
Woodland Daily Democrat	Woodland	California.
Watsonville Transcript	Watsonville	California.
Weekly Trinity Journal	Weaverville	California.
Weekly Standard	Eureka	California.
Weekly Palo Alto	Mayfield	California.
Weekly Bedrock Democrat	Baker City	Oregon.
Weekly Mercury	Oroville	California.
Western Watchman	Eureka	California.
Willows Journal	Willows	California.
Wood River Times	Hailey	Idaho.
Western Mining World	Butte	Montana.
Yreka Union	Yreka	California.
Yreka Journal	Yreka	California.

FINANCIAL STATEMENT—JULY 1, 1894, TO JULY 1, 1895.

Balance on hand July 1, 1894		$1,920 81
Bureau appropriation, forty-sixth fiscal year		10,000 00
Geological appropriation, forty-sixth fiscal year		15,000 00
Paid into Mining Bureau Fund		2,361 80
Contra.		
Salary of State Mineralogist	$3,000 00	
Salaries of Geological Assistants	6,695 70	
Traveling expenses of Geological Assistants	1,958 70	
Clerical assistance, geological work	693 30	
Sundries, geological work	1,577 42	
Maps	1,148 60	
Rent of Bureau	2,850 00	
Salaries, Bureau	6,706 00	
Library, Bureau	323 58	
Laboratory, Bureau	131 13	
Freight and express, Bureau	210 34	
Minerals and Museum, Bureau	101 18	
Postage, Bureau	534 48	
Sundries, fuel, water, light, etc.	591 76	
Clerical assistance of Bureau	100 00	
Balance forward	2,660 42	
Totals	$29,282 61	$29,282 61

FINANCIAL STATEMENT—JULY 1, 1895, TO JULY 1, 1896.

Balance on hand July 1, 1895		$2,660 42
Geological appropriation, forty-seventh fiscal year		15,000 00
Bureau appropriation, forty-seventh fiscal year		10,000 00
Paid into Mining Bureau Fund		1,908 70
Rebate on kodaks		244 80
Contra.		
Salary of State Mineralogist	$3,000 00	
Salaries of Geological Assistants	9,426 65	
Traveling expenses of Geological Assistants	4,644 14	
Clerical assistance, geological work	14 15	
Freight and express charges, geological work	25 80	
Sundries	544 10	
Rent, Mining Bureau	2,400 00	
Salaries, Mining Bureau	6,606 25	
Library, Mining Bureau	377 55	
Laboratory, Mining Bureau	31 20	
Freight and express charges, Bureau	67 41	
Minerals and Museum, Bureau	59 50	
Postage	271 00	
Sundry expenses, fuel, water, light, etc.	215 28	
Clerical assistance, Bureau	100 00	
Balance forward	2,030 89	
	$29,813 92	$29,813 92

REPORT OF THE STATE MINERALOGIST.

To the Trustees of the State Mining Bureau:

GENTLEMEN: Agreeably to the provisions of "An Act to provide for the establishment, maintenance, and support of a bureau to be known as the State Mining Bureau," etc., I herewith submit my report for the years 1895 and 1896, which is the thirteenth (third biennial) in the series of the State Mineralogist's Reports.

Quartz and Drift Mining.—I am pleased to say that continued activity has prevailed, and still continues, in nearly all lines of the mining industry, with every encouragement for still greater future development. A great deal of capital is seeking investment in legitimate mining enterprises, and it is a matter for congratulation that the citizens of California show confidence in the mines of their own State by investing as liberally as non-residents.

While nearly all other industrial pursuits are stagnant and unprofitable, that of mining seems to have proved profitable and remunerative during the past few years. Statistics show that of all the industrial occupations mining is the most profitable. The average annual product or earning per capita, in California, of those engaged in farming is about $300; in manufacturing, including its bounties, about $1,000; in mining, with all its burdens and penalties, nearly $1,500; and yet many people denounce the business of mining as comparatively precarious and unprofitable. The following censuses of 1894 and 1896 of those engaged in mining, milling, quarrying, well-boring, etc., prepared from the reports of our Field Assistants, show an increase of over 40% during the past two years. It is possible that some hundreds of white men and Chinese were not enumerated, inasmuch as many work alone, ground-sluicing or rocking in ravines remote from the mines and the roads:

CENSUS OF MINERS, QUARRYMEN, ETC.

Name of County.	1893–94.	1895–96.	
	White Men and Chinese.	White Men.	Chinese.
Alameda	356	266	
Alpine	1		
Amador	574	891	
Butte	427	711	
Calaveras	776	1,198	
Colusa	17	26	
Contra Costa	40	114	
Del Norte		86	
El Dorado	397	810	
Fresno	256	163	
Glenn	8		
Humboldt	169	243	4
Inyo	219	240	
Kern	111	503	
Lake	228	288	8
Lassen	31	47	
Los Angeles	224	618	
Madera	149	127	
Marin	349		
Mariposa	79	527	
Mendocino	12	5	
Merced		7	
Mono	214	94	
Monterey	19	3	
Napa	411	191	
Nevada	1,341	1,570	38
Orange	16	14	
Placer	767	1,047	55
Plumas	411	548	
Riverside	200	232	
Sacramento	96	332	174
San Benito	35	38	
San Bernardino	189	256	
San Diego	315	530	
San Francisco	209	105	
San Joaquin		27	
San Luis Obispo	88	37	8
Santa Barbara	148	244	
Santa Clara	804	578	
Santa Cruz	209	361	
Shasta	405	1,201	12
Sierra	630	538	
Siskiyou	1,569	1,469	484
Solano	61	64	
Sonoma	227	302	
Stanislaus	101		
Tehama	20	56	
Trinity	384	767	51
Tulare	43	55	
Tuolumne	420	1,058	
Ventura	38	25	
Yuba	72	62	
Totals	13,765	18,674	834
Grand totals	13,765	19,508	

While the total value of all mineral products in California in 1893 was $18,806,261, our Bulletins Nos. 7 and 8, for the years 1894 and 1895, respectively, show a gratifying increase; in the former to $20,203,294 44, and in the latter to $22,844,644 29. The following table is collated from the above-named bulletins, which give the production of each substance *by counties:*

MINERAL PRODUCTS OF CALIFORNIA.

Product.	1894.			1895.		
Antimony	150 tons		$6,000 00	33 tons		$1,485 00
Asbestos	50 tons		2,250 00	25 tons		1,000 00
Asphaltum	11,698 tons		233,800 00	25,525 tons		170,500 00
Bituminous rock	31,214 tons		115,193 00	38,921 tons		121,586 00
Borax	11,540,099 lbs.		807,807 00	5,959 tons		595,900 00
Cement	8,000 bbls.		21,600 00	16,383 bbls.		32,556 00
Chrome	3,680 tons		30,980 00	1,740 tons		16,795 00
Clays—						
Bricks	81,675 M	$457,125 00		131,772 M	$672,360 00	
Pottery uses	28,475 tons	35,073 00		37,660 tons	39,685 00	
			492,198 00			712,045 00
Coal	59,887 tons		139,862 00	79,858 tons		193,790 00
Copper	738,594 lbs.		72,486 00	225,650 lbs.		21,900 50
Gold			13,923,281 89			15,334,317 69
Granite	312,365 cu. ft.		228,816 00	288,449 cu. ft.		224,329 00
Gypsum	2,446 tons		24,584 00	5,158 tons		51,014 00
Infusorial earth	51 tons		2,040 00			
Iron ore	200 tons		1,500 00			
Lead	950,000 lbs.		28,500 00	1,592,400 lbs.		49,364 40
Limestone—						
Lime	373,500 bbls.	$318,700 00		397,764 bbls.	$386,094 00	
Limestone	15,420 tons	19,275 00		71,355 tons	71,690 00	
			337,975 00			457,784 00
Macadam	441,867 tons		369,438 00	840,650 tons		700,987 00
Magnesite	1,440 tons		10,240 00	2,200 tons		17,000 00
Manganese	523 tons		5,512 00	880 tons		8,200 00
Marble	38,441 cu. ft.		98,326 00	14,864 cu. ft.		56,566 00
Mineral paints—						
Copper	290 tons	$5,800 00		150 tons	$2,250 00	
Iron	100 tons	3,500 00		225 tons	3,375 00	
Ochre	220 tons	4,840 00		375 tons	2,800 00	
			14,140 00			8,425 00
	610 tons			750 tons		

Mineral waters	402,275 gals.		184,481 00	701,397 gals.		291,500 00
Natural gas—						
Carbon dioxide	80,000 cu. ft.	$4,072 00			$12,000 00	
Hydrocarbon		75,000 00			100,000 00	
			79,072 00			112,000 00
Onyx	500 cu. ft.		20,000 00	1,200 cu. ft.		12,000 00
Paving-blocks	2,517 M		66,981 00	2,332 M		73,338 00
Petroleum	783,078 bbls.		1,064,521 00	1,245,339 bbls.		1,000,235 00
Platinum	100 ozs.		600 00	150 ozs.		900 00
Quicksilver	30,416 flasks		934,000 00	36,104 flasks		1,337,131 00
Rubble rock	219,933 tons		295,400 00	414,038 tons		394,952 00
Salt	49,131 tons		140,087 00	53,031 tons		150,576 00
Sandstone	79,125 cu. ft.		30,792 00	55,242 cu. ft.		35,373 00
Sandstone concrete	18,000 tons		82,800 00			
Serpentine				4,000 sup. ft.		4,000 00
Soapstone				25 tons		375 00
Silver			297,331 55			599,789 70
Slate	1,800 squares		11,700 00	1,350 squares		9,450 00
Soda	1,530 tons		20,000 00	1,900 tons		47,500 00
Total			$20,203,294 44	Total		$22,844,664 29

While gold still continues to be by far our largest mineral product, the annual value of our non-metallic substances has now reached $1,348,280; hydrocarbons and gases, $1,404,321, and structural materials, $2,713,755. It is worthy of note that in addition to the precious metals there were 36 other mineral substances produced. From the above table it is evident that the great increase was due to the mining of precious metals.

The attention of investors has not been attracted to any one particular section, but every gold-producing county shared in the general prosperity. Trinity and Shasta counties on the north have been particularly favored by large investment of foreign capital, and the operations of the Mountain Mines Company (Limited) have directed the attention of prospectors and others to copper, and its exploitation is again becoming quite general. The Mother Lode belt, which extends through a number of counties in the State, has become a favorite field for investors in gold-bearing properties, and some gigantic operations are in progress and contemplation. The demand for the Bureau's geological map of the Mother Lode exhausted the supply, and a new and corrected edition was issued last spring. All mineral patents granted to January 1st of this year, and so much of the "Mariposa grant" as could be delineated upon the map without changing its form, have been added. There have been numerous "Mother Lode maps" issued within the past year by private parties, but the demand for our map continues.

So great an interest has been taken in the subject of the Mother Lode that the lectures of our Curator, Henry S. Durden, and H. W. Fairbanks, Ph.D., drew respectively large audiences. Mr. Fairbanks has kindly revised his notes, and his very interesting and useful paper, "Ore Deposits with especial reference to the Mother Lode," is printed in the latter part of this volume. The close study Mr. Fairbanks has given to this subject while in the employ of the Bureau makes him an authority, and his paper valuable. South of Tehachapi the same general interest prevails. In Kern County, 45 miles east of Mojave, a new district was formed during the winter of 1895–96, and some very promising ledges located. If the ledges hold with depth, Randsburg will become an important mining center, although it experiences serious drawbacks in scarcity of both water and fuel. The outlook for Riverside, San Bernardino, and San Diego counties is promising, and the last of the three boasts of having a mill (Golden Cross) containing the greatest number of stamps (100) under one roof in the State, although the total plant (140 stamps) is equaled by the Utica-Stickle.

Particular attention is called to the list of mills inserted at the end of each county under the head of "Gold," which has been prepared from the notes of our Field Assistants.

Hydraulic Mining.—Aside from Del Norte, Humboldt, Siskiyou, and Trinity counties, where there are no restrictions on hydraulic mining, it has been prosecuted in a comparatively small way by many companies and individuals, but their production of gold has helped to swell the total in no inconsiderable degree. The following list of applications (115) to mine by this method on the tributaries of the Sacramento and San Joaquin rivers have been granted by the U. S. Debris Commission *since* the list of 42 published in our last Report. There have been 233 applications, and 157 have been granted; the others are either pending or have been rejected:

HYDRAULIC MINES WORKING UNDER PERMISSION FROM THE U. S. DEBRIS COMMISSION.

Name of Mine.	Near.	County.	Applicant.	Mine Drains Into Tributary of—	Permit Granted.
1. Adkins	Ono	Shasta	Alonzo Engle		Jan. 20, 1896
2. Agate	Howard Creek	Sierra	A. Denmire	North Yuba	Nov. 20, 1894
3. Argentine	Downieville	Sierra	H. H. Meyer et al.	Yuba	Nov. 11, 1895
4. Badger Hill	Spanish Ranch	Plumas	A. B. Jacks et al.	Feather	Jan. 13, 1896
5. Blackhawk	Placerville	El Dorado	Eugene Piaggi	American	Nov. 18, 1895
6. Blue Gravel Placer	Sutter Creek	Amador	W. H. Glenn et al.	Mokelumne	Jan. 13, 1896
7. Bobby Burns	Placerville	El Dorado	Hy Niedecker et al.	American	Nov. 18, 1895
8. Brandy City	Brandy City	Sierra	A. Steinberger	Middle Yuba	Oct. 9, 1894
9. Canada	Port Wine	Sierra	O. F. Caya et al.	Yuba	Nov. 18, 1895
10. Cascade	Beckwith	Plumas	Cascade W. & Mining Co.	Feather	Dec. 2, 1895
11. Central Hill	Douglas Flat	Calaveras	W. Thomas et al.	Stanislaus	June 21, 1895
12. Chaparral Hill Gold Gravel	Onion Valley	Plumas	Ed. Bryan et al.	Feather	Dec. 16, 1895
13. Charcoal Ranch	Sierra City	Sierra	L. F. Fourier et al.	Yuba	July 23, 1895
14. China Hill	Volcano	Amador	Con. Amador & Volcano Mining Co.	Mokelumne	Nov. 23, 1894
15. Clay Bank	Meadow Valley	Plumas	H. A. Hallstead	Feather	Jan. 13, 1896
16. Cleveland	Scales Diggings	Sierra	D. Perkins	North Yuba	Nov. 27, 1894
17. Cole	Grizzly Flat	El Dorado	W. H. Cole	Cosumnes	Dec. 23, 1895
18. Coney	Ono	Shasta	G. M. Coney et al.	Sacramento	Mar. 17, 1896
19. Con. Sailor Creek Placer	Garden Valley	El Dorado	G. W. Davey	American	Nov. 18, 1895
20. Corkscrew Placer	Spanish Ranch	Plumas	S. F. Toland et al.	Feather	Sept. 2, 1895
21. Crown Point	Goodwin	Plumas	Crown Point Mining Co.	Feather	April 15, 1895
22. Dry Gulch	Volcano	Amador	O. M. Henry	Dry Creek	May 25, 1895
23. Dutch	La Porte	Plumas	S. Chapman	Yuba	Nov. 18, 1895
24. Dutra, Wilder & Co.	Dobbins Ranch	Yuba	Louis Wilder	Yuba	Feb. 5, 1895
25. Eagle Mining Claim	Sutter Creek	Amador	Lorenzo Canata et al.	Mokelumne	Nov. 4, 1895
26. El Dorado Placer	Garden Valley	El Dorado	W. Bacchi et al.	American	April 22, 1895
27. Ellen Taylor	Fairplay	El Dorado	Cy. Mulkey	Cosumnes	July 27, 1896
28. Emma Harding	Taylorsville	Plumas	J. E. Evans	Feather	Jan. 13, 1896
29. Epley	Placerville	El Dorado	L. Rolland et al.	American	May 28, 1895
30. Eureka Hydraulic	Placerville	El Dorado	J. Pascoe	American	Sept. 30, 1895
31. Farrel	Columbia Hill	Nevada	Eureka Lake & Yuba Canal Co.	Yuba	Nov. 18, 1895
32. Fine Gold	Vallecito	Calaveras	G. A. Meinecke	Stanislaus	June 22, 1895
33. Forest Home	May	Amador	W. A. Roberts et al.	Cosumnes	Dec. 23, 1895
34. Forty-nine Flat	Volcano	Amador	Hadey & Bolles	Mokelumne	June 30, 1895
35. Galena Hill	Camptonville	Yuba	W. R. Williams et al.	Yuba	Nov. 25, 1895
36. Garfield Flat	Johnsville	Plumas	P. Lorenzo	Feather	Nov. 6, 1895
37. Goodman & Bund	Volcano	Amador	Goodman & Bund	Mokelumne	Mar. 23, 1895
38. Goodman Brothers	Volcano	Amador	Goodman Brothers	Mokelumne	May 2, 1895

Hydraulic Mines Working Under Permission from the U. S. Debris Commission—Continued.

Name of Mine.	Near.	County.	Applicant.	Mine Drains Into Tributary of—	Permit Granted.
39. Gold Deposit	Kelsey	El Dorado	D. Croft.	American	Jan. 16, 1896
40. Gorman	Michigan Bluff	Placer	H. L. Van Emon	American	Mar. 30, 1896
41. Grizzly Bear	Johnsville	Plumas	N. Rossi	Feather	Nov. 6, 1895
42. Halloway	Hopkins Creek	Plumas	J. S. Gould et al.	Feather	Nov. 20, 1894
43. Hard Times	Bath	Placer	J. Hoffman et al.	American	April 22, 1895
44. Hidden Treasure	Pine Grove	Amador	Bear Bar Mining Co.	Mokelumne	Mar. 30, 1896
45. Homestake	Sierra City	Sierra	C. Wickman et al.	Feather	Sept. 28, 1895
46. Independence		Yuba	J. A. Broyles	Yuba	Mar. 17, 1896
47. Iowa	Forest Hill	Placer	W. Henning et al.	American	May 25, 1895
48. Irish Hill	Oleta	Amador	G. W. Smith	Mokelumne	Dec. 23, 1895
49. J. C. Day	Georgetown	El Dorado	J. C. Day	American	May 30, 1896
50. James Watson	Igo	Shasta	J. C. Voluntine	Sacramento	Mar. 23, 1895
51. Jaybird	Camptonville	Yuba	J. E. Raum	Yuba	Jan. 20, 1896
52. Joubert	Camptonville	Sierra	F. Joubert	Yuba	July 15, 1895
53. Kanaka Flat	Spanish Ranch	Plumas	W. Wampler	Feather	Jan. 20, 1896
54. Kate Gray	Volcano	Amador	Giovanni Rossi	Mokelumne	May 30, 1895
55. Kentucky Flat	Georgetown	El Dorado	H. E. Pickett	American	Dec. 23, 1895
56. Kerr	Yankee Jim's	Placer	J. G. De Bons	American	Mar. 30, 1896
57. King Sayre	Gibsonville	Sierra	W. A. Schofield et al.	Yuba	Nov. 18, 1895
58. Last Chance	Placerville	El Dorado	Ed. Hancock et al.	American	June 10, 1895
59. Last Chance	Sierra City	Sierra	H. Goering	Feather	July 29, 1895
60. Leroy Hedge	Brownsville	Yuba	Leroy Hedge	Yuba	May 8, 1895
61. Lewis	Spanish Ranch	Plumas	Fred Lewis	Feather	Nov. 18, 1895
62. Lone Star Placer	Cromberg	Plumas	W. De Vinny	Feather	Oct. 14, 1895
63. Lost Camp	Blue Cañon	Placer	J. Rathburn et al.	American River	Dec. 16, 1895
64. Manzanita	Sweetland	Nevada	Kate Hayes Mining Co.	Yuba	Oct. 28, 1895
65. Marlow	Sonora	Tuolumne	A. P. Scheld	Tuolumne	July 27, 1896
66. Martelle	Salmon Falls	El Dorado	L. Dormody	American	Feb. 18, 1895
67. Martin Hydraulic	Placerville	El Dorado	C. W. & W. W. Martin	American	Mar. 30, 1895
68. Meehan Placer	Aqueduct	Amador	J. Meehan	Sacramento	Nov. 30, 1896
69. Michigan Hill	Quincy	Plumas	J. Higgins	Feather	Dec. 2, 1895
70. Mill Gulch Gravel	Amador City	Amador	H. M. Dickerman et al.	Cosumnes	Mar. 30, 1896
71. Miocene	Crescent Mills	Plumas	C. G. Hepler	Feather	Dec. 30, 1895
72. Mitchell Hydraulic	Placerville	El Dorado	R. Blair et al.	American	Jan. 22, 1895
73. Mohawk	Johnsville	Plumas	F. Sorocco	Feather	Mar. 30, 1896
74. Mt. Gregory Gold	Georgetown	El Dorado	P. Phillips	American	Dec. 1, 1895
75. Mugginsville	Eureka North	Sierra	W. A. Morse	North Yuba	Nov. 11, 1895
76. Nellie Bly	Igo	Shasta	A. A. Ludwig et al.	Sacramento	April 6, 1896
77. Nip and Tuck	Bangor	Butte	Dickhouse Brothers	Feather	Oct. 2, 1894
78. No Chunk	Michigan Bluff	Placer	E. S. Thompson et al.	American	Mar. 30, 1896

79. Noonday	Sierra City	Sierra	J. Egbert	North Yuba	Oct. 23, 1894
80. Northern Placer	Cromberg	Plumas	P. Traynor	Feather	Nov. 6, 1894
81. North Rim	Yankee Jim's	Placer	G. H. Pease et al.	American	Feb. 26, 1895
82. Omega	Omega	Nevada	M. C. Tully	South Yuba	Nov. 11, 1895
83. Pacific	St. Louis	Sierra	D. Conlan	Yuba	Nov. 18, 1895
84. Pineleaf	Spanish Ranch	Plumas	J. Schafer	Feather	Dec. 23, 1895
85. Plumas Blue Gravel	Nelson Point	Plumas	Plumas Blue Gravel Mining Co.	Feather	Dec. 30, 1895
86. Plumas Imperial	Quincy	Plumas	Plumas Imperial Gravel Mining Co.	Feather	July 8, 1895
87. Poor Man's Hydraulic	Placerville	El Dorado	C. Jordan	American	Dec. 16, 1895
88. Princess	Redding	Shasta	O. H. Simons	Sacramento	Mar. 30, 1896
89. Proper	Murphy	Calaveras	J. Sybel	Stanislaus	Mar. 17, 1896
90. Quaker Hill	Nevada City	Nevada	G. C. Sargent	Yuba	Dec. 30, 1895
91. Raffetto Placer	Placerville	El Dorado	G. Raffetto	S. F. of American	July 20, 1896
92. Railroad Hill Gravel	Fourth Crossing	Calaveras	L. G. De Martini	Calaveras	Dec. 24, 1895
93. Red Hill and Telegraph Hill	Rancheria	Amador	M. Fitzgerald et al.	Mokelumne	July 21, 1895
94. Reese	Redding	Shasta	G. Reese	Sacramento	Jan. 6, 1896
95. Richmond Hill	La Porte	Plumas	Good Hope Mining Co.	Feather	Nov. 18, 1895
96. Roman	Taylorsville	Plumas	John Smith	Feather	Jan. 13, 1896
97. Roomie	Sierra City	Sierra	L. Logemacini	Yuba	July 29, 1895
98. Sailor Boy	Brandy City	Sierra	M. Cortez	Yuba	Aug. 5, 1895
99. St. Lawrence	Moore's Flat	Nevada	Ah Wing	Yuba	Oct. 28, 1895
100. Shealor	Volcano	Amador	J. E. Newson	Mokelumne	Mar. 18, 1895
101. Sherwood & Snyder	Chinese Camp	Tuolumne	L. M. Sherwood et al.	Tuolumne	Jan. 13, 1896
102. Spanish John	Rough and Ready	Nevada	J. Black	Yuba	Dec. 17, 1894
103. Steele & Co.	Brownsville	Yuba	J. H. Steele	Yuba	Sept. 25, 1894
104. Strawberry Placer	Vallecito	Calaveras	J. Enos	Stanislaus	May 31, 1895
105. Terry Hill	Spanish Ranch	Plumas	E. H. Hard	Feather	Oct. 14, 1895
106. Tiedeman	Georgetown	El Dorado	H. E. Pickett	American	Nov. 18, 1895
107. Tiger	Forest Hill	Placer	J. Ward et al.	American	May 13, 1895
108. Tippecanoe	Pike City	Sierra	G. Parent	Yuba	Oct. 28, 1895
109. Trafton	Yankee Jim's	Placer	J. N. Findlay	American	Mar. 30, 1896
110. Try Again Hydraulic	Placerville	El Dorado	G. Varozza	American	July 20, 1896
111. U. S. Grant	Blue Tent	Nevada	E. P. Hagar	South Yuba	Jan. 1, 1895
112. Volcano Gold Gravel	Volcano	Amador	Volcano Gold Gravel Mining Co.	Mokelumne	Dec. 16, 1894
113. Willow Placer		Sierra	N. B. Willets et al.	Yuba	Sept. 2, 1895
114. York Mining Co.	Brownsville	Yuba	York Mining Co.	Yuba	May 15, 1895
115. Zantgraf & Closs		El Dorado	J. Zantgraf et al.	American	April 29, 1895

Whole number of applications made 233
Number of permits granted prior to August 14, 1894 42
Number of permits granted since that date 115

Total number granted 157

On June 11, 1896, Congress passed the Sundry Civil Service bill, which contained an item appropriating $15,000 to defray the expenses of the California Debris Commission, so that assurance is given for the continuance of this Commission for another year.

Product of Precious Metals.—To those who have not received nor seen our Bulletins Nos. 7 and 8, the following table will prove interesting, and show at a glance the production of and the increase or decrease, by counties, of the precious metals:

GOLD AND SILVER PRODUCT OF CALIFORNIA.

County.	1891.			1895.		
	Gold.	Silver.	Totals.	Gold.	Silver.	Totals.
Amador	$1,331,916 54	$280 27	$1,332,196 81	$1,391,929 40	$1,089 00	$1,393,018 40
Butte	473,672 65		473,672 65	697,260 85	8,935 53	706,196 38
Calaveras	2,119,365 67	5,182 80	2,124,548 47	1,717,916 14	77 00	1,717,993 14
Del Norte	8,000 00		8,000 00	8,250 00		8,250 00
El Dorado	366,707 67	356 00	367,063 67	700,101 31	447 68	700,548 99
Fresno	8,202 00		8,202 00	47,249 00		47,249 00
Humboldt	41,326 00	13 86	41,339 86	92,635 20		92,635 20
Inyo	52,638 91	83,640 00	136,278 91	92,142 28	188,329 23	280,471 51
Kern	310,706 91	39,700 00	350,406 91	231,433 31	46,064 28	277,497 59
Lassen	35,283 00		35,283 00	25,000 00		25,000 00
Los Angeles	34,500 00		34,500 00	23,330 00		23,330 00
Madera	167,791 60	180 00	167,971 60	162,323 74		162,323 74
Mariposa	153,707 51	38 75	153,746 26	216,622 39	7 07	216,629 46
Merced	762 50		762 50	1,500 00		1,500 00
Mono	358,824 46	11,549 12	370,373 58	552,690 54	84,910 37	637,600 91
Monterey	8,000 00		8,000 00			
Nevada	1,830,154 80	475 51	1,830,630 31	1,789,815 66	400 00	1,790,215 66
Orange				144 00		144 00
Placer	1,851,214 52	664 37	1,851,878 89	1,599,634 79	5,272 53	1,604,907 32
Plumas	499,358 83		499,358 83	602,951 05	271 52	603,222 57
Riverside	93,322 50		93,322 50	285,106 00	2,550 00	287,656 00
Sacramento	70,326 00		70,326 00	145,872 75		145,872 75
San Bernardino	130,419 78	148,242 89	278,662 67	131,360 00	219,410 30	350,770 30
San Diego	266,408 73	189 60	266,598 33	344,307 57	600 00	344,907 57
San Luis Obispo	1,200 00		1,200 00	3,000 00		3,000 00
Santa Barbara				4,000 00		4,000 00
Shasta	617,436 68	5,032 31	622,468 99	781,696 32	28,417 20	810,113 52
Sierra	604,721 54		604,721 54	694,469 67	106 96	694,576 63
Siskiyou	760,781 83		760,781 83	950,006 43	177 30	950,183 73
Stanislaus	26,368 50		26,368 50	26,481 50		26,481 50
Trinity	1,012,665 84	325 00	1,012,990 84	1,166,745 13	1,257 28	1,168,002 41
Tuolumne	547,448 06	1,072 16	548,520 22	666,754 15	312 62	667,066 77
Tulare				16,320 00		16,320 00
Yuba	107,480 20		107,480 20	111,482 34		111,482 34
Unapportioned	32,568 66	388 91	32,957 57	53,786 17	11,153 83	64,940 00
Totals	$13,923,281 89	$297,331 55	$14,220,613 44	$15,334,317 69	$599,789 70	$15,934,107 39

Petroleum.—Had the same price for petroleum prevailed in 1895 as in 1894 and 1896, the value of this product would have placed it *second* in value in the list of mineral productions. Very early in the present year the price increased at Los Angeles as much as 50 cents per barrel, and the total given in our Bulletin No. 8 would have been increased at least $489,897 50. There is quite a little excitement in several portions of the State over the prospecting for petroleum and natural gas, notably so near Cholame Valley, in San Luis Obispo County; near Coalinga, in western Fresno County; near Livermore, Alameda County; on Louterwasser Creek, Contra Costa County; and in the Reche and San Timoteo cañons, in San Bernardino County, where it is reported some oil has recently been found. Fuller reference to this subject will be found in the body of the report, under the head of "Petroleum." A small refinery of 1,000 gallons per day capacity has been erected in Fresno since the visit of our Field Assistant, and a larger one is contemplated.

Tin.—Numerous prospectors in Modoc and Shasta counties seem determined to find tin there. A number of samples of the rock and some "buttons" have been received and tested at the Bureau, and invariably the so-called "tin" proved to be finely disseminated iron.

Reports.—The same plan in the arrangement of subjects has been retained for this as was devised and carried out in our XIIth Report. The method of arranging subjects, counties, mines, etc., in alphabetical order has made it a very simple matter to quickly find any particular subject or mine, and has given general satisfaction. Some persons, however, object to the brevity of the paragraphs descriptive of mines, and particularly to back references. They point to the fact that the bulky VIIIth and Xth Reports, now out of print, are highly prized, but these critics do not reflect that the general public does not want a repetition, but only up-to-date information; besides, the increased cost to the State for printing this old matter would amount to a very large sum. As before, the Field Assistants were instructed to make their reports complete but concise. Their manuscript has been carefully corrected, condensed, and even rewritten several times. It is believed that it cannot be further reduced without detracting from its usefulness. The demand for our XIIth Report exhausted the edition of six thousand within six months after its appearance, and double that number could have been distributed had we had them on hand. A great many importuned us to have it reprinted, but, as before stated, the very great expense prohibited it. Hereafter we will ask to have all our reports and bulletins stereotyped so that future demands may readily be supplied. Our stock of other reports is also exhausted, except that of the IXth (1889) and XIth (1892), and these may be obtained upon application.

Those from abroad desiring our reports to obtain an idea of our resources, and not for the technical papers contained therein, have been and will continue to be supplied gratuitously upon the receipt of the proper amount to defray postage. Our postage account, as seen from your Secretary's report, and which formerly amounted to quite a large sum, has been greatly reduced by requiring parties within the State to remit the necessary amount, and I am pleased to say that they cheerfully approve of the rule, which was made necessary by the rapidly diminishing income of the Bureau Fund.

As mining is the most flourishing and one of the most important industries of our State, it has been suggested that the Report of the State Mineralogist be issued annually instead of biennially. The interests of the miners and contemplating investors demand that the descriptions of the mines be issued as early as possible in order to supply the necessary information.

Appropriations.—With our present appropriation it is impossible for our Field Assistants to visit *all* portions of the State *each* year, and consequently we are not able to give as complete descriptions at the time of going to press as is desirable. If the appropriation were larger, more men could be kept in the field, all portions of the State visited, and the descriptions of the mines be issued as bulletins. Should the appropriation remain the same as at present, and it were possible, *sixty per cent* of the two years' appropriation should be available during the first year, in order that more field work might be accomplished during the summer months. After the Report has been prepared for the State Printer (September 15th of the second fiscal year), five or six months intervene before the men again take the field. Summer and fall months are the best for field work, and during these times it should be rushed, although during the past winter the men were kept in the field nearly all the time, owing to its very open character, and when they came in they were employed several months at the Bureau in writing up their notes.

If possible, this Bureau should be placed upon a permanent basis in regard to funds, the same as the University, etc., in order to produce work of a superior character. As long as it leads an ephemeral life, existing from Legislature to Legislature, it is impossible to undertake certain lines of scientific work that the character of the institution demands, and which might otherwise be stopped, if commenced, through lack of funds.

Bureau Fund.—The Bureau does not receive any benefit from the "stock certificate tax," except from the City and County of San Francisco. The Secretary of State has kindly furnished us with a list of mining and kindred incorporations for each county, and we have sent them, together with a copy of the law, to the Assessor of each county, with the request that he attend to this duty and collect the tax. One of your Board, Mr. Thomas B. Bishop, suggested a very feasible plan which will remedy this evil to a great extent, to wit: Let stamps similar to Internal Revenue stamps be printed and sold by the State Controller, or proper authority, to mining and kindred incorporations, and then the Secretary of every company should be compelled by law to affix one of these stamps to every certificate of stock issued or transferred; the amount paid for these stamps to be placed to the credit of the Bureau in the State Treasury.

County Resources.—As a means of advertising the mineral resources of each county separately, it has been suggested that the contents of this Report be segregated by counties, and a limited number—say, one thousand—be printed and sent to the Supervisors of each county for general distribution. It brings each county's resources *directly* to the attention of the parties desired, and avoids comparison with other counties, as is sometimes the case when the complete Report is sent.

Geological Survey.—California has done but little in the way of a geological survey. By Acts of the Legislature in 1853 and subsequently, "geological examinations" were ordered, and Dr. John B. Trask, the first State Geologist, placed in charge, and who made four reports. In 1860, by an Act of the Legislature, the first actual geological survey was instituted, and Prof. J. D. Whitney, the second State Geologist, placed in charge of it. While he gathered and published a large amount of useful information, he was not particularly fortunate in his methods of carrying on the work. At all events, the survey was suddenly discontinued before it had accomplished the practical and economical results hoped for it by the mining community. In 1880, in response to a deeply felt need for information bearing on the mineral resources of the State, the State Mining Bureau was established.

Among other things, the original Act provided for the collection and study of "specimens of all the geological and mineralogical substances, including mineral waters and building-stones, found in the State, especially those presenting economic or commercial value." Since the establishment of the Bureau, and especially in the last eight years, during which time the State has been liberal in granting appropriations, some geological work of a *reconnoissance character* has been carried on in addition to the investigations which bear more directly on gold mining.

It has been felt, however, for some time, that as the Bureau is organized, neither the mining work nor that in geology can be carried on to the best advantage together and by the same assistants. The work in mining, with the growing details of the present day, needs men especially trained in all the aspects of that important industry. So it is also with the lines of geological investigation; the time was when the science was much less complicated and a man could be not only an expert in all the problems then connected with mining, but also a practical geologist. Now the best results can only be reached by men trained each in his own special line, and while the two subjects of geology and mining are in certain respects intimately related, yet in others they are widely separated.

Consequently, it has been thought best to recommend, for the fullest efficiency of the State Mining Bureau, that the work of mining proper be separated from that of geology; that the former be devoted mainly to the examination of mines and the gathering of statistics relating to them. In this work only the most experienced assistants, *mine inspectors*, should be employed and given power by law to enter all mines, report upon their condition, and enforce, where needed, better and safer working methods. This would prove a direct benefit and safety to the working miner and a protection to the stockholder and investor. Only a few of the mines, and they may be counted upon one's fingers, have refused admission to our Field Assistants. Some of these mines have since proved questionable, and it is probable that none of them would bear a close scrutiny.

It is further proposed that the work in geology be organized, in the form of a geological survey, as a department of the Mining Bureau, and have an experienced geologist in charge.

In the establishment of separate investigations in geology, it is necessary to call attention to some of the great advantages to the State from an economical standpoint of taking up this work in a thorough manner.

California has great area, its mineral resources are numerous and varied; and if there is any portion of the United States where it can be considered of economic importance to undertake a geological survey, it certainly must be here.

The value of a geological survey as a basis for the development of the mineral resources of a country is attested by the fact that all civilized countries either have or are now engaged in this kind of research.

A preliminary geological and mineralogical map of the State was issued by the Bureau in 1890. In many respects this was a valuable production, representing our best knowledge at that time. The progress of geological knowledge has been so rapid since then that it certainly will not redound to the credit of the State if the map is allowed to stand as an example of its highest ability in this line. To undertake a revision of this map, based upon accurate detailed work, should not be delayed if the State would maintain the character of its scientific work.

The scope of a geological survey must be broad in order to secure the most important economic returns, and should embrace the following main lines of investigation:

1. The preparation of a topographical contour map in the form of atlas sheets. This can, without doubt, be arranged so as to be carried on with the assistance of the topographical division of the U. S. Geological Survey, that survey paying half of the expense. These maps are of the highest practical value in many ways, besides being necessary for accurate geological mapping.

2. The mapping of the geological formations in important local areas, finally spreading over the whole State not covered by the U. S. Geological Survey. Accurate discrimination of the different formations and their structural relations is of the highest possible value, particularly in the examination for coal, oil, amount and character of the water-supply, etc. It is also of importance in distinguishing metalliferous areas from those not metalliferous, and determining the character and extent of such deposits.

3. The systematic collection of representative specimens of the minerals and rocks of the different formations in the districts examined. With but slight extra expense duplicate collections can be made for the High Schools of the State, a course which would be of great educational value and of importance, especially in communities interested in mining.

4. A study of the building-stones, their character and accessibility. In this line the need is most pressing, in view of the great increase in the use of stone.

5. A description of the mineral springs, and analyses of their waters. This is a subject which should also be included in a geological survey, and would be of incalculable benefit.

6. The dissemination of the principles of geology and mineralogy among the people of California, especially the prospectors and investors, enabling them to avoid many mistaken and useless explorations.

Some have thought that, as the U. S. Geological Survey is carrying on mapping in portions of the State, it is unnecessary that the State undertake any work of the same kind. The arguments against the State giving up this work to the U. S. Geological Survey are numerous and weighty. The following are some of the more important ones:

The results of the Survey are not published until several years after the work has been done, and are not then accessible to the masses of the people. Its publications, with the exception of the annual reports, are not for free distribution, and, as a matter of fact, almost none of these reach the masses of the people who really need the knowledge.

One of the most important results of a State survey is the gathering together at some accessible point, in a museum, of a classified collection of the minerals and rocks, so that people can study them. If this work is left to the U. S. Geological Survey, the collections all go to Washington, where they are practically inaccessible to citizens of California. State pride should not allow the work to be done alone by the United States Government, particularly when the State reaps so little benefit from it. The Mining Bureau has made a good beginning, but there is a vast opening for enlarged usefulness in this line.

A large amount of geological work of a general reconnoissance character has already been done, and a systematic survey could be taken up in a most economical manner at the present time. Because of what has already been done, the reports of the survey could be devoted to careful investigation in individual districts, and to the preparation of special monographs upon coal, iron, stone, etc.

There can be no doubt that if a geological survey is undertaken along the lines and with the methods of modern research, very valuable results will accrue to the State. A wider knowledge and appreciation of the principles of structural geology would direct exploitation in the right direction, and save much disappointment. The Mining Bureau is already fitted with a laboratory which, with comparatively little expense, could be arranged for the use of the survey.

Work could be begun with a modest appropriation, and when the survey has shown its right to live by its usefulness, the appropriation could be increased with a proportionate benefit.

Hydrography.—The streams of our State afford an immense amount of power which is practically unutilized as yet. Our industrial progress might be materially promoted were these streams regularly gauged and their average and minimum stages noted. At present the waters of the American and San Joaquin rivers, and of some of the smaller streams, are utilized for generating electrical power, and all of them could be utilized several times over for the same purpose.

Too much importance cannot be given to this subject, and the contents of this volume, under the head of "Mining and Irrigating Canals, Artesian Wells, etc.," will afford a slight basis for a beginning. Unfortunately, the valuable data collected some years ago by the State Engineering Department is not now available.

Department of Mines.—It is confidently believed that the mineral industries of the whole country would be greatly promoted should a Department of Mines be created in the United States Government. The mineral output, for 1895, of all the States amounted to $622,230,723, and it seems almost incredible that such an important industry should be without representation in the Cabinet. The various bureaus relating to mining are scattered through the several existing departments, and as a matter of economy, as well as a means of stimulating and encouraging fuller and more systematic development and research, such a department should be created. Properly it should embrace Archæology, Botany, Ethnology, Geography, Geology, Irrigation, Mining, Palæontology, etc.

Official Visits.—On January 23d and 24th of this year our Chief Executive, Governor James H. Budd, honored us with his presence and displayed a commendable and an intelligent interest in all of the departments. He appeared well pleased with the condition and the manner of conducting the affairs of the Bureau, and we are led to believe that he will lend his aid toward improving it when needed. He is the third Governor to inspect this Bureau.

Bulletins.—The bulletins issued by this Bureau have been most favorably received, and the demand for them from nearly every State in the Union and every country in the world is phenomenal. The *Mine-Timbering*, the *Cyanide*, and the *Mill Practices* bulletins have been copied and printed entire, with all the illustrations, in the Mining and Scientific Press of San Francisco, the Scientific American Supplement of New York, the London Mining Journal, the Australian Mining Standard of Sydney and Melbourne, and the Canadian Mining Review of Montreal; besides, very full excerpts have appeared in papers all over the world. There will have been issued during the present administration ten bulletins, as follows:

Bulletin No. 2—Mine-Timbering, by W. H. Storms.—As intimated in our last Report, the edition of 5,000 was speedily exhausted, and a second edition early in 1895 became imperative. The author rewrote a large part of it and made important additions thereto. It continues to be eagerly sought for, and as it has now been stereotyped, future demands may be cheaply and quickly supplied.

Bulletin No. 3—The Gas and Petroleum Yielding Formations of the Great Valley of California, by W. L. Watts.—This work has met with unqualified approval, but dealing purely with a local subject, it has not been so much in demand as others of the series. Recently there has been quite a demand for it by the citizens of Fresno, Merced, San Benito, Santa Clara, and other valley counties, in consequence of the petroleum developments near Coalinga and elsewhere.

Bulletin No. 4—Catalogue of California Fossils (Parts II, III, IV, and V), by Dr. J. G. Cooper.—This book contains papers relating to the Palæontology of California, and may be considered supplementary to the volumes on that subject published by the State Geological Survey under Prof. J. D. Whitney, as well as to Part I of the Catalogue of California Fossils, published in our VIIth Annual Report. An edition of 2,500 was printed, and a demand from scientists and scientific bodies has been proportionately large.

Bulletin No. 5—The Cyanide Process, Its Practical Application and Economic Results, by Dr. A. Scheidel, E.M.—This work has had an unprecedented run, and a second edition became necessary and was issued a few months ago. As precautions had been taken to have it stereotyped, the issuing of a second edition was a very simple matter. It is the standard work on this subject the world over, and the parent company controlling the cyanide plants pought them by the dozen to place in the hands of their chiefs of staff. It is so well thought of that we have received very flattering offers from famous booksellers for the agency and sale of the work, but the State not being in the business for profit we could not offer them any inducements, and declined their offers. Its popularity continues, and a third edition will become necessary within a year or two.

Cyanide plants have not become numerous in this State from the fact that but very few tailings were preserved and retained. It is undoubtedly true that nearly as much gold as was saved in the mills was contained in the tailings which passed into the streams and bays. In one way it is unfortunate that our mills are located so near the streams and their tributaries; otherwise, this source of wealth would have been preserved to the present generation. In Bodie, where the tailings virtually saved themselves, five cyanide plants, with capacities ranging from fifty to one hundred and fifty tons per day, have been erected and are in successful operation. Besides these there are a few small ones scattered over the State. This bulletin has been the means of causing all or a part of these works to be erected.

Bulletin No. 6—California Gold Mill Practices, by Ed. B. Preston, M.E.—This practical work has been in great demand, and while professing nothing original, it elucidates the practices in the several parts of the State, and has been termed by eminent mining engineers as a practical and thoroughly up-to-date publication.

Bulletin No. 7—Mineral Statistics of California for the Year 1894, by Chas. G. Yale, Statistician.—This table was issued late in the summer of 1895, and proved most interesting as well as a surprise to a very large number of people well informed of the State's productions, but who were, nevertheless, unaware of some of our mineral productions and their value. The delay in getting this bulletin to press arose from either the negligence or the reluctance of the producers to respond to our inquiries, although we assured them that the individual productions would be so grouped that no one's private business would be revealed. In some cases as many as four or five letters of inquiry were sent, and yet some failed to respond. In these cases we obtained the information from other sources.

Bulletin No. 8—Mineral Productions of California for 1895, by Chas. G. Yale, Statistician.—The producers throughout the State, appreciating the importance of these statistical reports, and seeing from Bulletin No. 7 that we did not violate our promise and reveal any one's business, generally responded promptly to our inquiries and enabled us to issue this table early in April, 1896. What is thought of our work at home and abroad may be gathered from the following extracts:

[From the Mining and Scientific Press, San Francisco, May 9, 1896.]

Bulletin No. 8 was received from the State Mining Bureau last Tuesday, and is of considerable value. Apart from its unquestionable accuracy, its timeliness is also noticeable, it being months in advance of the date at which such compilations are ordinarily available, reflecting credit on the Bureau and all connected therewith.

[From the Mining Journal, Railway and Commercial Gazette, of London, May 30, 1896.]

California During 1895.—It was only in December last that we had occasion to draw attention to the mineral output of California during 1894, which reached us through the medium of the California State Mining Bureau, and which gave very forcible evidence of the progress made by the industry throughout the whole of the State. In our comment upon these statistics we complimented the Bureau upon the excellent work it was

> doing, and upon its energy and promptitude in making the world acquainted with the achievements of California, and at the same time we lamented that so excellent an example was not generally imitated by other countries, of whose outputs we desire an early and complete knowledge. In publishing the figures for 1895, the Bureau has shown much greater promptitude than it displayed last year. The statistics reached us during the week as Bulletin No. 8 of the Mining Bureau, and are commendably complete. These figures, we are gratified to see, entirely bear out all that we have said from time to time respecting the mining industry of California, and prove at a glance that it is progressing slowly, but, in all likelihood, only the more surely, etc.

We hope in time to gather the statistics of gold and silver, which are now collated by the officers of the United States Mint.

Bulletin No. 9—Mine Drainage, Pumps, etc., by Hans C. Behr, Mechanical Engineer.—It has just been issued, and is already favorably received, as it is a book of much merit, carefully edited, and fully illustrated by two hundred and six illustrations. It fills a long-existing void for a practical, concise, yet full, treatise on all water-raising machinery. The high professional standing of its author will insure confidence in its statements and conclusions.

Bulletin No. 10—A Bibliography Relating to the Geology, Palæontology, and Mineral Resources of California, by Capt. A. W. Vogdes.—The Captain is in the Fifth Artillery of the United States Army, and is a member of most of the Academies of Sciences in the United States, besides many foreign scientific societies. In the course of his studies, he has had occasion to refer to many works, and, perceiving the necessity of a work of this kind to lighten the labors of the professional student, he has prepared this pamphlet in his off hours during the past few years. That it will be appreciated by the class for whom it was intended, goes without saying.

Bulletin No. 11—The Oil-Yielding Formations of Los Angeles, Santa Barbara, and Ventura Counties, by W. L. Watts.—Early in 1894 the petroleum industry of Los Angeles began to assume such an importance, that it was desirable to study the geological features of Southern California, and compare the geological horizons and stratigraphical features of the several oil-producing territories. About the same time we received the following:

> At the regular meeting of the Los Angeles Chamber of Commerce, held August 1, 1894, the following resolution, presented by George W. Parsons, Chairman of the Committee on Mines and Mining, was, on motion, unanimously adopted:
>
> WHEREAS, A great and increasing interest is being manifested in the petroleum and other mineral development of this portion of the State, and we learn that the State Mining Bureau, through one of its fieldmen, has investigated and reported upon the oil- and gas-bearing formation of the Sacramento and San Joaquin valleys, thus imparting very valuable information, to the great assistance of capitalists and investors, and consequent increase in production; and whereas, it appears very desirable that similar investigation should be made, particularly of the oil- and gas-bearing formation on this side of the Coast Range and south of the Sierra Madre range, with direct reference to this locality and the immediate vicinity of Los Angeles, for the reason that large investments have been made upon this side of the Coast Range in the minerals referred to, which should certainly entitle us to due consideration; therefore, be it
>
> *Resolved*, That this Chamber present this whole matter to the attention of the State Mineralogist at San Francisco, with a request that he take such action in the near future, including active investigations in the field, as shall constitute a proper presentation of the whole subject, with maps, charts, and such other aids as are necessary to define the mineral belts and give a clear conception of the whole subject.

In compliance with the above request, we detailed Mr. W. L. Watts to make a thorough examination of the several fields, as he had had some years' experience with the oil-bearing formations in the great valley of California. He entered upon this duty October 1, 1894, and has completed the work for part of the field. He has been constantly employed on this work and has devoted about nineteen months to field work alone. He has been very successful in solving many of the intricate geological problems, and it has been necessary to supply to many of those engaged in the business blue-print copies of his sketch maps, in order to take practical advantage of his researches in advance of the regular publication, as they need them in their business now. They have proven his work to be valuable by following his directions, and thereby obtaining good wells in a different direction to that followed by themselves.

Deeming it eminently proper to give the public the benefit of his researches as early as possible, we authorized him to accede to the request of the citizens of Los Angeles and lecture upon this subject. He lectured once before the Chamber of Commerce and twice before the Southern California Academy of Sciences, to which the public in general were invited. He illustrated his lectures with stereopticon slides of views, geological sections, etc. He did not attempt to go into the subject fully, but to give only his deductions from the accumulated records. That it was appreciated is evidenced by the very full reports in the newspapers and the complimentary notices thereof, and the following:

The following is a copy of resolutions adopted by the Executive Committee of the Academy of Sciences, May 8, 1896:

> *Resolved*, That the papers relating to the geology of the Southern California oil fields, read before the Southern California Academy of Sciences by Mr. W. L. Watts of the State Mining Bureau, are very highly appreciated by the Academy, not only for their excellence as scientific treatises, but also for the valuable practical information they have conveyed to those interested in that field of development, in this section of the State.
>
> *Resolved*, That in view of the useful results achieved by Mr. Watts in the faithful, painstaking, and original investigations made by him, we heartily recommend a continuance of the scientific work he has so ably prosecuted in Southern California under the direction of the State Mineralogist, Hon. J. J. Crawford.

His bulletin will be read with much interest by the public generally, and will be studied closely by geologists, and particularly oil men. It is in manuscript, and soon will be sent to the State Printer.

Mr. Ross E. Browne has had in contemplation for two years past the preparation of a bulletin on the subject of *Water Ditches, Pipes and the Flow of Water Therein, Wheels, etc.*, but his professional duties, together with ill health, have prevented the fruition of his plans. The well-known ability of Mr. Browne, and his intimate acquaintance with this subject, will insure a great demand for the work when issued.

Mr. Albert Maltman, of Grass Valley, has consented to write a monograph on *Chlorination of Gold-Bearing Sulphurets, etc.* He is part owner of and conducts the Nevada County Reduction Works at Grass Valley, and hence, he is thoroughly familiar with a subject upon which many desire information, and which is not available in any text-books.

Miscellaneous Papers.—In the latter part of this volume will be found original papers of great interest and instruction. The able article on *Compressed Air*, by Arthur De Wint Foote, will direct attention to this most important means of transmitting power, and may enable the student to compare its efficiency and economy with that of electricity.

The value of the article on *Timber Preservation*, contributed by John D. Isaacs, Chemist in charge of the Southern Pacific Company's (Pacific System) timber-preserving plants, can hardly be overestimated. The cost of "burnettizing," about $3 per M, is so small that statutes should be enacted to enforce its adoption by all parties placing timber in a mine. Then the most horrible of all mine disasters, fire, would practically be prevented. As timber thus treated lasts twice as long as, if not longer than, untreated timber, the economy should commend itself to mine and mill owners, to say nothing of the avoidance of danger from fire. It is also important that trestles and flumes supplying water for power, municipal, and other purposes should be so treated to avoid the danger of being destroyed by forest fires. Many other sources of employing burnettized lumber and timber will suggest themselves to practical men.

Dr. Salathè's paper will prove a valuable acquisition to the technical literature on the subject of the rapidly growing industry, petroleum. His researches are extensive and have never before been given to the public. His ability to treat such a subject is attested by his years of employment as chief chemist for the Standard Oil Company of New York, and the Union Oil Company of California, at Santa Paula.

The very excellent article by W. F. C. Hasson, Electrical Engineer, on the several electrical transmission plants in successful operation in this State, together with the numerous illustrations, will prove a valuable addition to this class of literature. It is given in a full, yet concise and practical form, that will be appreciated by business men.

In order to give the general mining public of California the latest light on subjects that are useful and essential in their business, we have copied from creditable sources the following: *The Coming Motive Power*, from the "Inventive Age"; *The Sampling and Measurement of Ore-Bodies in Mine Examinations*, by Edmund B. Kirby; *Comstock Ore-Sampling*, by John D. McGillivray.

Other Mining Bureaus, copied in the main after our own, have been established in British Columbia, Colorado, and Washington. Mr. Carlyle, the Provincial Mineralogist, spent some days with us to learn our methods and laws, and no doubt the result of his investigations will appear when his office shall have got into good working condition. In Colorado, *mine inspection* is connected with the office, as recommended for our own in a previous paragraph herein.

California Miners' Association.—During the last two years the California Miners' Association has done much to advance the mining industry, and has prepared the way for much needed legislative relief.

After vainly protesting against the issuance of railroad patents covering land possibly mineral in character, the Association had a bill introduced in the present Congress at its first session, providing for the segregation of the mineral lands within the railroad land grants by commissioners to be appointed by the President for that purpose. The bill passed both Houses of Congress, and is now pending in the lower house, awaiting an agreement by the two houses upon amendments added to the bill in the Senate. It is believed the bill will become a law during the short session of Congress beginning in December next.

The Association secured from the present Congress an appropriation of $250,000 for the construction of restraining barriers, in accordance with the provisions of the Act of March 1, 1893 (commonly known as the Caminetti Act). These works are to be constructed for the purpose of "restraining such material as is now, or may hereafter be, lodged in the tributaries of the Sacramento and Feather rivers, and the branches of such tributaries, resulting from mining operations, natural erosion, or other causes." The report of Col. Geo. H. Mendell, 1882, and the report of the so-called Biggs Commission, 1891, are declared to be the basis for the proposed works, which are to be constructed by the California Debris Commission, under the direction of the Secretary of War.

Other measures, introduced in Congress at the request of the Association, are still pending in that body, with fair prospects of final passage, notably the one providing, among other things, for the transfer of contests as to the mineral or agricultural character of the land from the U. S. Land Offices to the local courts.

Field Assistants.—Every county in the State, except Modoc, has been visited by one or more of our Assistants. In 1895, Fred C. Mathyas visited, in the order named, the western parts of Siskiyou and Trinity counties, Del Norte, Humboldt, Mendocino, Lake, Napa, Sonoma, and Marin counties, and in 1896, the mountainous portions of Fresno, Tulare, and Kern counties, Inyo and Mono counties. In 1895, Mr. John H. Means traveled through Santa Clara, Santa Cruz, San Benito, Monterey, the northern part of Santa Barbara and Ventura, the western or valley parts of Kern, Tulare, Kings, Fresno, Madera, Merced, Stanislaus, San Joaquin, Sacramento, Placer, Yuba, and Butte counties, Sutter, Tehama, Glenn, Colusa, Yolo, Solano, Contra Costa, and Alameda counties. In 1895, Mr. Edward B. Preston visited the eastern part of Siskiyou and Trinity counties, and Tehama, Lassen, Plumas, and Sierra counties. In 1896, he visited El Dorado, Butte, Nevada, and the extreme eastern part of Placer County. In 1895, Mr. W. H. Storms visited Amador, Calaveras, Tuolumne, Mariposa, and Madera counties. In 1896, he inspected Riverside, San Bernardino, and San Diego counties, and the greater part of Placer County, besides making a flying trip in August last through what are known as the "Mother Lode" counties, to bring the data of this important section up to date. In 1895, Mr. James H. Tibbett visited Alpine, Mono, and Inyo counties. Besides his special field work on petroleum, Mr. W. L. Watts visited, in 1895 and 1896, the counties of Los Angeles, Orange, Santa Barbara, and Ventura.

Before the Field Assistants began their work for the Report they were provided with kodaks, and although all of them, excepting Mr. Watts, were unacquainted with photography, their work has been very creditable, and some of the hundreds of views taken of mines and incidental works are utilized in this report. Mr. Watts has taken pictures that are unexcelled and are veritable works of art.

Unremitting and untiring in his zeal to advance the work of the Bureau, unceasing in his donations to make the mineralogical collection as complete as any, and for his daily attendance and advice, the thanks of the State as well as of myself are due to our honored President, Mr. J. Z. Davis.

To you, gentlemen, I desire to tender my heartfelt thanks for the very cordial support accorded me in line with my duties. I shall forever cherish most pleasant recollections of our four years' official intercourse.

Our thanks are due to the *Journal of Electricity, Mining and Scientific Press*, and the Folsom-Sacramento Electrical Power Company, for loan of illustrations and other courtesies.

I am pleased to say that each and every one of the Field Assistants and office employés has displayed ability and zeal in his duties, and to each I tender my thanks for hearty coöperation in the work of the Bureau.

The members of the mining engineering profession, and the many friends of the Bureau throughout the State, deserve the thanks of the Trustees and Mineralogist for assistance rendered in various ways.

Respectfully submitted.

J. J. CRAWFORD,
State Mineralogist.

ANTIMONY.

Kern County.

Antimony Mine.—It is ¾ mile N. of Havilah, at 3,400′ altitude. The ore (stibnite) occurs in irregular masses in a mineralized zone in the porphyry. Developments consist of a 70′ tunnel and a 60′ winze, with some drifts. G. Miller and J. B. Ferris, of Havilah, owners.

Bousby Mines.—See our Xth and XIIth Reports, pp. 225 and 21. They are on Antimony Mountain, near the head of San Emidio Cañon. Idle.

Erskine Creek.—See our XIth and XIIth Reports, pp. 237 and 21. There are several small mines here which have yielded stibnite and native antimony. Idle.

Grace Darling Mine.—It is an old location near Erskine Creek. Idle.

Padre Mine.—See our XIIth Report, pp. 21–22. It is in Tailhold Cañon, and was located in 1892. Idle.

San Emidio Mines.—See our VIIIth, Xth, and XIIth Reports, pp. 680, 225, and 22. They consist of five patented and four unpatented claims, and are in San Emidio Cañon, in the southwestern part of the county. The ore averages 40% antimony, and occasionally carries silver, iron, and arsenical pyrites. Worked intermittently.

Undeveloped Deposits exist in the mountains east of San Emidio Cañon, in a granite formation for a distance of 4 miles.

Riverside County.

Crowell Mine.—It is 5 miles S.W. of South Riverside, at 1,700′ elevation. A number of superficial cuts have been made at various places on the claim, and on one of them several hundred pounds of stibnite have been taken out. The ore occurs in irregular bunches in a mass of much shattered and decayed rock. The workings had caved, and a satisfactory examination was impossible. The ore found was of excellent quality. J. Irving Crowell, of South Riverside, owner.

ARGENTIFEROUS GALENA.

Inyo County.

A number of mines, which were running when our last Report went to press (1894), have ceased operations, and, until there is a revival in the silver market, it is useless to continue a record of them.

In the *Cerro Gordo District*, the *Belmont*, *Ignacio*, *Wittekin*, and many others, formerly heavy producers, are idle. In the *Union mines* a few chloriders work on a lease. They are jigging the old dumps. In the *Beauregard* and *New Town mines* a few men are employed to keep the timbers up; little, if any, ore is being produced. The silver mines in *Panamint Range* are practically idle, only assessment work being done. In the vicinity of Darwin several mines are still working. In the main shaft of the *Defiance group* prospect work has been done below the 400′ level, and in the *Lucky Jim group* some ore is being stoped from a drift on the 600′ level.

Landmark Mine.—It is on the western slope of the Inyo range, 8 miles S. of Keeler. A vein, 1′ to 2′ wide, of argentiferous galena, dipping 85° W., and inclosed in limestone, is developed by three tunnels, 75′ to 150′ long, and a 75′ winze in the longest one. Philip Gehrig, of Keeler, owner.

Last Chance No. 2 (*Sorba*) *Mine.*—See our XIIth Report, p. 24. It is 2 miles E. of Darwin, at 4,175′ altitude. The vein courses S.W. and N.E., nearly at right angles to the strike of the extremely hard silicious limestone, in which it occurs. The main shaft is 500′ deep, and follows the vein slightly out of perpendicular to a depth of 300′, where a drift, 100′ long, has been run S.W. The ore here is about 2′ thick, and consists of carbonate of lead, with an occasional nest of galena. The ore-shoot is more than 100′ long, dipping nearly vertically, and lies S.W. of the main shaft. At the 300′ station a cross-vein, striking N.W. and S.E., and averaging 4′ in width, was encountered, and the shaft follows it down for the next 200′. In that distance the vein changes its course so that at the bottom of the shaft the two veins are nearly parallel and about 15′ apart. Extremely rich ore has been taken from this cross-vein. Two new shafts, each about 100′ deep, have been sunk 300′ and 600′ S.W. of the main shaft. In the farther one another ore-shoot was found, and is shortly to be prospected. Wood being expensive, a 12 H.P. petroleum gas-engine runs the hoist, and seems to give entire satisfaction. D. C. Lane, of Darwin, owner.

Modoc Consolidated Mining Co.'s Mines.—See our XIIth Report, p. 24. They are on Lookout Mountain, 15 miles S.E. of Darwin. Stoping is being done in the lower (No. 2) tunnel, which is 1,200′ long, and where a large ore-body has been discovered lately. Frank Fitzgerald, of Modoc, lessee.

Montezuma Mine.—It is on the western slope of the Inyo range, 6 miles S.E. of Big Pine. The vein is 12′ wide, and lies in a limestone formation. Discovered some years ago by a slide from the mountains, when several tons of ore were reduced in a small smelter. In 1894, a 7′ vein of high grade was discovered. Thos. Hill et al., of Big Pine, owners.

Sorba Mine.—See Last Chance No. 2.

Star Mine.—It is in Argus Cañon, 8 miles S. of Modoc. The vein is a mass of honeycombed quartz, 2′ thick, and carries hornsilver and a little gold. Paul Pfefferle, of Modoc, owner.

St. John and St. Arthur Mines.—See our XIIth Report, p. 24. A new tunnel is being driven at a point 100′ below the old workings. J. J. Gunn, of Modoc, owner.

Orange County.

Although silver-bearing lead ores are found at several points in this county, the mines are not exploited to any extent. The silver-lead ores are usually accompanied by zinc and other objectionable bases; and, being far from railroads or other means of cheap transportation, the cost of shipping or treatment is expensive. However, within the past year, mining operations have been resumed on a small scale in the Silverado and Elsinore districts.

Acme Mine.—See our XIIth Report, p. 25. It is 7 miles W. of Elsinore. In the prospective stage. Budd Waller, of Perris, owner.

Blue Light Mines.—This group is near the head of Santiago Cañon, in Silverado District, at 2,000′ elevation. The developments consist of numerous tunnels and open excavations. A small plant has been built at the foot of the mountain, and an attempt to concentrate the sulphide minerals (lead, zinc, and iron) is to be made. — Dunlap, of Los Angeles, owner.

Old Dominion Mine.—See our XIIth Report, p. 25. It is 7 miles E. of Elsinore, at 2,500′ elevation. After the failure to smelt these ores in 1894, the property remained idle until the spring of 1896, when preparations were made to mine and ship a quantity of ore. James Balfour et al., of Elsinore, owners.

San Bernardino County.

Carbonate Mine.—See our IXth, Xth, XIth, and XIIth Reports, pp. 233, 527, 361, and 26. It is at Oro Grande, and is the principal mine in the district. The ore-shoots occur in limestone in large masses, having a vein-like form. The ore is limonite, lead carbonate, and manganese oxide. It contains both silver and gold. Ore is shipped to Colorado smelters. T. J. Fleming et al., of Los Angeles, owners; H. Robinson, of Oro Grande, superintendent.

Cleveland Mine.—See our IXth Report, p. 234. It is 5 miles S.W. of Calico. It has considerable development, and produces a good grade of lead-silver ore, but has been idle several years.

Dana Mine.—It is a new prospect, 1 mile S.E. of Cushenbury, in the the Black Hawk Mountains. It has an 80′ shaft. H. Dana, of Victor, owner.

Duncan & Clark Mines.—They are 6 miles N.W. of Barstow, at 3,000′ elevation, and are new prospects; the deepest workings being 75′. The ore is lead carbonate, carrying a variable amount of silver. Hornsilver, also, is found in some of the claims, associated with malachite. Duncan & Clark, of Barstow, owners.

Galena Camp.—It is 7 miles S.W. of Oro Grande. The claims are all in prospective stage. Not visited.

Galena Mine.—It is a prospect near Oro Grande.

Galoot Mine.—See our XIIth Report, p. 26. It is a prospect in Oro Grande District. Idle. — Jones, of Oro Grande, owner.

Harrison Mine.—See our IXth and XIIth Reports, pp. 235 and 26. It is a prospect, 5 miles N.E. of Oro Grande. The ores are galena and zinc-blende, carrying gold and silver. Idle.

Lookout Mine.—It is a prospect near Oro Grande. Idle.

North Camp.—It is 7 miles N.W. of Oro Grande. All the claims in the camp are idle. Not visited.

Northern Cross Mine.—It is ½ mile E. of Oro Grande. It has a 90′ shaft, and some superficial work, but little ore. Estate of H. Easton, of Oro Grande, owner.

Oro Grande District.—See our Xth, XIth, and XIIth Reports, pp. 527, 361, and 26; also under head of "Gold" and "Silver." The only lead-silver mine in operation in this district is the Carbonate.

Santa Fe Mine.—It is a prospect in Oro Grande District.

Silver Mountain District.—See Oro Grande District.

West Camp.—It is 12 miles W. of Oro Grande. All the claims are idle. Not visited.

Siskiyou County.

A vein of quartz containing galena crosses the ridge between Fox and Boulder creeks, 4 miles W. of Callahan. Several open cuts and short tunnels were made on it. Now abandoned.

ASPHALTUM AND BITUMINOUS ROCK.

Kern County.

Buena Vista Oil and Asphaltum District.—See our XIIth Report and Bulletin No. 3, pp. 26 and 41. The principal asphaltum-bearing formations are in the foothills of the Coast Range, on the western side of the San Joaquin Valley, and the localities known as the *Buena Vista* and the *Sunset Oil Districts.*

Buena Vista Oil Co.—See our XIIth Report and Bulletin No. 3, pp. 28 and 41. The asphaltum and petroleum claims of this company are in the Buena Vista District, and are fully described in the above reports. Idle.

Jewett & Blodget Claims.—See our Bulletin No. 3, p. 27. They are in the Sunset District. Since our last Report four shafts have been sunk in Sec. 13, T. 11 N., R. 24 W., 96′ to 110′ deep, connected by drifts, and serve as reservoirs for the seepage of liquid asphaltum, which is said to be well suited for coating and insulating mixtures. Fifty barrels are said to be produced daily at present, and can be increased by further development. Messrs. Jewett & Blodget, of Bakersfield, owners.

North Buena Vista Oil Co.—The property of this company is 3 miles N.W. of Asphalto, in Sec. 13, T. 30 S., R. 21 E.; three shafts, 14′ to 40′ deep, serve as reservoirs for the tar-like petroleum which collects in them. One well, 8″ in diameter and 325′ deep, is said to flow 1 bbl. of oil per day. The strata penetrated dip N.E., and are as follows:

Debris	8′
Black shale	7′
Sandy clay and gravel	23′
Black shale	4′
Bituminous sandstone	33′
White shale (a little oil)	7′
Sandy clay and gravel	12′
Brown shale and thin sandstone	86′
Flinty white oil-bearing shale	17′
Brown shale	38′
Soft white shale	20′
And black and brown shale to the bottom.	

A second well is being drilled. A. Devoto, of San Francisco, secretary; J. W. Briggs, of Bakersfield, superintendent.

Standard Asphaltum Co.'s Mine.—See our XIIth Report and Bulletin No. 3, pp. 28 and 41. It is in the Buena Vista District, being the S.W. ¼ of Sec. 27, T. 30 S., R. 22 E., and is 1½ miles S.E. of Asphalto, at about 1,200′ altitude. A great amount of indiscriminate prospecting has been done on this property, but recently more systematic development is carried on. Two shafts, 280′ and 310′ deep, have been sunk on a vein-like deposit, which dips 60° to 70° N.E. They are 400′ apart, follow the dip of the vein, and drifts are being run to connect them. A horse-whim at each shaft is used for hoisting, and a gasoline-engine for forcing air into the mine. The high-grade asphaltum in the main vein is from 6″ to 5′ thick, and grades into brown bituminous rock. It fills joints in the country rocks and spaces between the bedding planes. In general, the so-called vein conforms to the bedding of the rocks, which are soft sandstone, but the foot-wall is greatly broken by compression, and in places dips away from the vein. The asphaltum from this vein is said to run 85% to 90% pure, and is largely marketable without refining. The surface is covered with soil and disintegrations to such a depth that the vein-like deposits cannot be traced on the surface. The refinery is situated at Asphalto, the terminus of the railroad, and is furnished with 21 kettles, of which 6 are now in use; the daily capacity per kettle is about 1⅔ tons. The crude asphaltum is heated in the kettles; the volatile oils driven off; the impurities—clay, sand, etc.—settle, and the mass is tempered by adding crude petroleum. The former crude methods of testing its consistency by pulling or chewing it, have been replaced by determining its melting temperature. Twenty-six men are employed. C. E. Hayes, of San Francisco, secretary; Wm. Bell, of Asphalto, superintendent.

Sunset District.—See our XIIth Report and Bulletin No. 3, pp. 28 and 26. Idle.

Marin County.

Seams of asphaltum are visible in the clay-shale cliffs at Bolinas Bay.

Mendocino County.

Extensive beds of bituminous rock exist at Point Arena, which contain from 6.8% to 11.2% volatile matter. Fully described in our VIIth Report, pp. 200–202. Idle.

Monterey County.

The industries of this county are principally agriculture. The lands in the valleys are generally cultivated; the hills and mountain slopes are used for pasture. Bored wells are numerous in the principal valleys; and in the lowlands west of Castroville, etc., they are in part artesian. Water for irrigation may be diverted from Arroyo Seco and other mountain streams. The mineral resources which have been or may become of economic importance are bituminous rock, coal, gold, limestone, sandstone, mineral waters, etc.

Mylar Mine.—See our XIth Report, p. 259. It is in the foothills on the south side of San Lorenzo River, 11 miles E. of King City, at about 800′ altitude. The deposit is in irregular bunches about 600′ wide, 16′ thick, and a total length of about ¼ mile. It occupies the channel of an old stream, and waterworn bowlders underlie the bituminous rock. It overlies porous sandstone and shales near their contact with the granitic rocks on the east. The sand in the bituminous rock is generally coarse-grained. From 1′ to 3′ of hard crust is formed on the surface, below which the rock is softer. Three men are employed. The Mylar Asphalt Co., owner; Thomas Mylar, of Lonoak, manager.

San Antonio River Deposit.—See our VIIth and XIIth Reports, pp. 85 and 29. It is in Sec. 35, T. 24 S., R. 10 E., 7 miles S.W. from Bradley station, and is undeveloped.

San Luis Obispo County.

Bituminous rock of various grades occurs in a belt in many places in the southwestern part of the county near the coast. It occurs both as stratified layers, and in segregated bunches. It consists essentially of sand disseminated through stiff, heavy bitumen, which forms a compact mass. Iron, lime, magnesia, etc., are also present in various quantities. That containing about 14% to 17% bitumen is suitable for all sorts of pavements, while the poorer grades (brea) may be used for fuel, etc.

Beckett Mine.—It is on the point of a hill about 100′ above the town of Arroyo Grande. The bituminous rock is from 2′ to 4′ thick, and is overlaid by a heavy bed of gravel and soft sandstone. It was worked a few years ago by a cut 125′ long, 12′ wide, and 15′ deep at its face. J. F. Beckett, of Arroyo Grande, owner.

Jordan Mine.—See our XIIth Report, p. 29. It is on the Corral de Piedra grant, 7 miles S.E. of San Luis Obispo, at about 250′ elevation. The bituminous rock occurs in a large bunch in the soft sandstone, and is overlaid by 2′ to 10′ of sandy clay. Its depth is unknown. It is worked in an irregular, open cut, about 100′ in diameter and 50′ deep. The rock is hauled to Pismo and shipped in vessels. Fourteen men are employed. Jordan Bituminous Rock and Paving Co., of San Francisco, owner; E. A. Crossman, superintendent.

Oregon Co.'s (California Bituminous Rock Co.'s) Mine.—See our VIIth, Xth, and XIIth Reports, pp. 98, 574, and 30. It is about 7½ miles S. of San Luis Obispo, and is idle. Oregon Bituminous Rock Co., of Portland, Or., owner.

San Luis Obispo Bituminous Rock Co.'s Mine.—See our VIIth, Xth, and XIIth Reports, pp. 97, 572, and 30. It is on the P. C. R. R., 7 miles S.E. from San Luis Obispo, at about 200′ altitude. The company owns 1,100 acres of land, on which a vast quantity of bituminous rock occurs, and outcrops in many places. There are seven open cuts from which it has been mined; one, known as "Black Rock, No. 3," is working, and six are idle. It is at the base of a low hill, on the east side of the railroad, with which it is connected by a spur ¼ of a mile long. This cut is 240′ long, 60′ wide, and 40′ deep at the face. The bituminous rock is 30′ or more thick, of uncertain extent, and passes under a soft sandstone, dipping 15° S.W. The rock is broken up, carefully assorted, sacked, and shipped by rail. The company has on the property a "bituminous rock disintegrator" of 80 tons daily capacity. The rock passes through a crusher, thence into a horizontal cylinder 18′ long and 38″ inside diameter; in it the rock is warmed by steam, which passes around the cylinder and through the central revolving shaft and hollow arms arranged on it, and thoroughly mixed, made uniform in character, and greatly reduced in bulk. The reduction in freight and other expenses of handling more than equals that of disintegration. The machine is driven by an engine, and the poor bituminous rock (brea) used for fuel. Ten men are ordinarily employed. It is temporarily idle. W. G. Hughes, Phelan Building, San Francisco, secretary; James Cormack, of Edna, superintendent.

Tar Springs Asphalt Mine.—See our XIIth Report, p. 30. It is 9 miles E. of Arroyo Grande, at about 600′ altitude. It occurs as superficial deposits from springs. The following analysis is by chemist C. A. Ogden, of San Francisco:

Sand	6.83%
Clay	3.36
Lime	2.81
Asphaltum	87.00
Total	100.00

Idle. Tar Springs Asphalt Co., of Los Angeles, owner; L. W. Johnson, of Los Angeles, superintendent.

Santa Barbara County.

During the last two years, work has been actively prosecuted at the La Patera Mine, at the deposits of bituminous sand at Carpinteria, and at the Alcatraz refinery. Extensive deposits of asphaltum have also been uncovered at the Sisquoc, Waldorf, and Kaiser mines, in the northern part of the county.

Alcatraz Refinery.—See Las Conchas.

Harris Mine.—See Pacific Asphalt Co., and our XIIth Report, p. 30.

Kaiser Mine.—It is situated 3 miles E. of Graciosa, and comprises about 200 acres. It is developed by a number of open cuts and eight tunnels, from 100′ to 200′ in length. This body of asphalt is said to be from 2′ to 20′ in thickness. Consolidated Asphalt Co., owner; G. E. Hannaman, of No. 207 S. Broadway, Los Angeles, secretary.

Las Conchas Mine.—It and the Alcatraz refinery are situated on the seashore at Carpinteria. The mine consists of a body of bituminized sand, or sand soaked with maltha, and embraces an area of about 75 acres, estimated to be 25′ or more in average thickness. The maltha is evidently derived from the bituminous shale on which the sand rests. The prevailing dip of these shales is N. 20° W., and the angle of inclination is for the most part 70° or more. The bituminous sand appears to lie horizontally, or to dip to the N.W. at a very slight angle. The process of mining is as follows: The surface, consisting of 6′ or 8′ of loam, is removed by hydraulicking into the ocean; a thin stratum of yellow clay which overlies the bituminous sand is then stripped off, and the sand is excavated with hot spades, loaded into trucks, which are hauled by a cable up an inclined plane to the upper floor of the refinery, where it is dumped into a mixer, consisting of a steam-jacketed cylinder in which revolving arms break the lumps. From the mixer the sand falls into vats of boiling water—the maltha floats, and the sand sinks to the bottom, where revolving "worms" carry the sand to a hopper, feeding a "bucket conveyer," which carries the sand through a flume to the point of discharge, where each bucket is played on by a jet of water to free it from the sand. The maltha, called crude flux, flows from the surface of the water through a flume to a tank, whence it is pumped into a storage tank at a higher elevation. From the storage tank the "crude flux" runs by gravity into two refining kettles of 15 tons capacity each, where it is subjected to a temperature, commencing at 100° F. and finishing at 240° F., for about twenty hours. In this process the aqueous vapor is driven off. The "refined flux" is carried by steam-jacketed pipes to the mixing department, where it is used as a flux for treating asphaltum from the La Patera Mine. This treatment consists of adding the refined flux to the crude asphaltum, and revolving the mass in drums of 5 tons capacity, and at a temperature of about 350° F. The amount of flux added depends on the degree of hardness required in the refined asphaltum. In about five hours the charge is run into a settling-kettle, wherein the impurities settle, and are removed from the bottom by a worm, and used as fuel. The refined asphaltum is conducted by a steam-jacketed pipe to the "barreling tank," from which it is drawn into a traveling kettle, running on an overhead gear, and discharging the asphaltum into barrels. During all these processes the asphaltum is kept in a state of fluidity to admit of its being handled with celerity. The process of separating the maltha from the sand and refining the "crude flux" is continuous; the manufacture of the refined asphaltum is intermittent. The capacity of these works is 75 tons in twenty-four hours. About 30 men are employed in the Las Conchas mines and 30 in the refinery. The Alcatraz Asphalt Co., of San Francisco, owner; A. F. L. Bell, of Carpinteria, resident manager.

La Patera Mine.—See our XIIth Report, p. 30. It is on the Den ranch, on the coast, 10 miles W. of Santa Barbara. It is worked by four shafts, 25′, 70′, 150′, and 200′ deep, respectively, and a 100′ tunnel. The asphaltum occurs in bunches in a vein-like deposit, 2′ to 12′ thick, and that from the low levels becomes very porous. The mine is provided with steam hoisting works and pumps. Twenty-three men are employed. Alcatraz Asphalt Co., of San Francisco, owner; A. F. L. Bell, of Carpinteria, superintendent.

Moore's Mine.—It is on the coast at Moore's Landing, 7 miles W. of Santa Barbara. Asphaltum occurs in bunches of 50 to 1,500 tons each, in a 75′ bank of sandy clay, and also projects above the water in places near the beach. The bunches are disclosed by the bank caving away, partly caused by the asphaltum expanding as the pressure is relieved; veins and "stringers" of asphaltum extend from them to uncertain depths. Five men are employed. J. F. Moore, of Santa Barbara, owner; David Culver, of Goleta, superintendent.

Pacific Asphalt Co.'s Mines.—They are 13 miles S.E. of Santa Maria, at about 600′ altitude. The asphalt occurs in irregular masses and vein-like bunches in soft, sandy clay, and is said to be 50% to 60% pure. The impurities in the crude materials consist principally of sand and sandy clay. The company works the *Harris* mines and six cuts on the *Newland ranch*, the adjoining property. A refinery, erected in 1894, has about 15 tons daily capacity. The rock passes from the crusher into two melting-tanks, where about 30 gals. of crude petroleum per ton is added and melted by superheated steam in the jackets around the tanks. It then passes into a settling-tank of 20 tons capacity; after the sand, etc., settle to the bottom, the asphaltum is drawn into a tempering-tank, where the process is completed. The sediment from the settling-tank is used for fuel in the refinery. The refined asphaltum is shipped in barrels. There are 30 to 35 men employed in mining, refining, coopering, teaming, etc. A. N. Millspaugh, of Santa Maria, superintendent.

San Carlos de Jonate Ranch.—See our XIIth Report, p. 32.

Santa Maria Asphalt Co.'s Mines.—See our XIIth Report, p. 32. They are 10 miles S.E. of Santa Maria, at 600′ to 700′ altitude. Asphaltum and bituminous rock outcrop over a large area. The developments consist of numerous open cuts and tunnels, 10′ to 115′ long, in which a vast quantity of asphaltum is exposed, in vein-like bunches and disconnected masses, varying from low to high grade. The country rock is soft sandstone and sandy clay. Three men are employed in developing. S. Kaiser, of Santa Maria, manager.

Sisquoc Grant.—It is 8 miles N. of Los Alamos, and embraces 35,485.9 acres. On it are two of the largest known deposits of asphalt in the world. (See map and cross-sections.) The deposit, designated as the *Brea*, is 10,560′ in length, of 500′ average width, and of 300′ average depth. If 20 cu. ft. constitute a ton, there are 79,200,000 tons of crude material in this deposit. The *Mesa* deposit lies on a plateau 300′ above the valleys which surround it on three sides, and at 1,900′ elevation. It is entirely exposed, except the back portion, which is covered with a light soil from a few inches to several feet in depth. It is about 5,000′ in length, of 800′ average width, and of 100′ average depth, and contains, approximately, 22,222,200 tons of crude material. On account of its elevation it can all be handled by gravitation at a small expense. This deposit, like the Las Conchas deposit at Carpinteria, owned by the same company, is a mixture of asphalt with pure quartz sand containing no dirt or organic matter non-bituminous, so that the process of purification is simple and perfect.

The following analysis indicates the character of the product:

San Francisco, November 15, 1894.

Analysis of two Samples of Bitumen from Sisquoc Mesa Deposit.

	Crust Ore from Surface.	Ore from Shaft taken from 20′, 40′, and 50′ Below Surface.
Petrolene	77.46%	80.74%
Asphaltene	22.54	19.26
	100.00%	100.00%

Referring to the above, material such as this will, in every respect, constitute a first-class material for paving purposes. The bitumen we have found to be firm, cohesive, and elastic.

(Signed:) THOS. PRICE & SON.

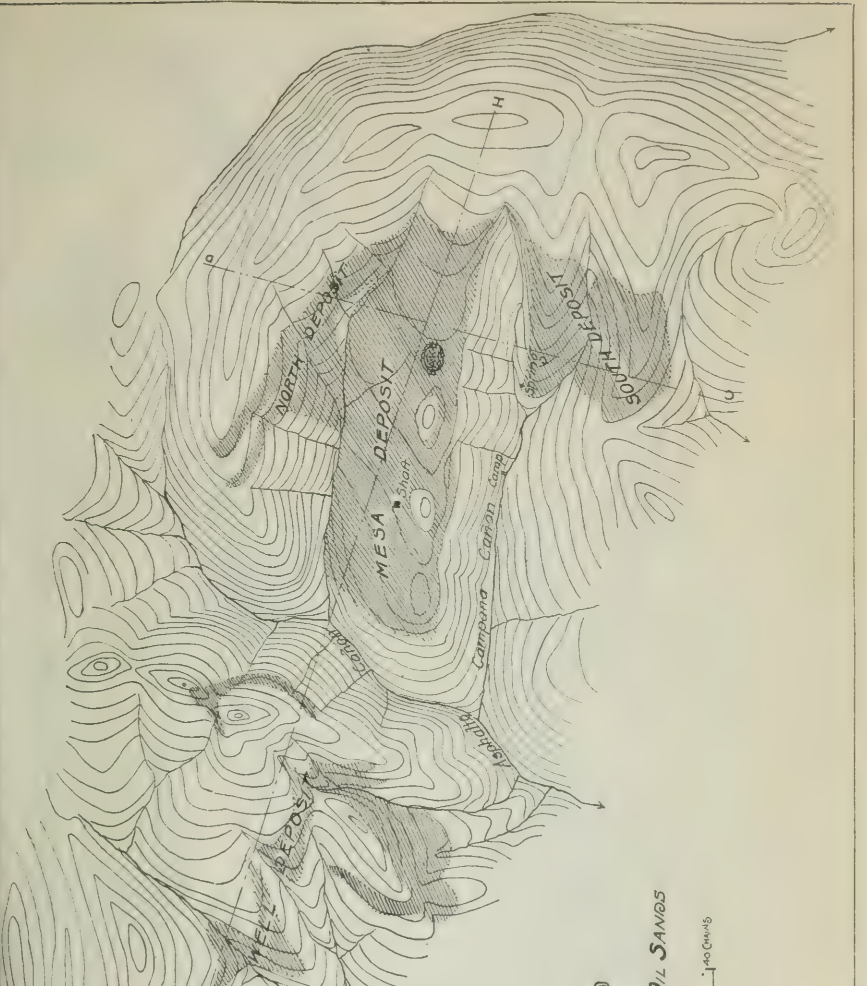
The company is now erecting at the Mesa deposit a large refining works with a capacity of 3,000 tons refined product per month. Thirty men are employed. Alcatraz Asphalt Co., owner; W. N. Cowles, of San Francisco, president; A. F. L. Bell, of Carpinteria, manager.

Waldorf Asphalt Mine.—It is 1¼ miles from Waldorf, and comprises 1,153 acres in the southwestern portion of the Guadalupe ranch. The developments consist of a 274′ tunnel, from the end of which are drifts 205′ W. and 60′ E. along the vein. The ledge of asphaltum is said to vary from 1′ to 8′ in thickness.

Analysis of Asphaltum from the Waldorf Mine.

By Dr. F. Salathè.

Total bitumen soluble in chloroform	76.2%
Moisture	1.8
Mineral residue (infusorial earth)	22.0
Organic matter, insoluble	Traces.
	100.0


PART
OF
SISQUOC RANCHO
Showing
BITUMINOUS DEPOSITS and OIL SANDS
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0
10
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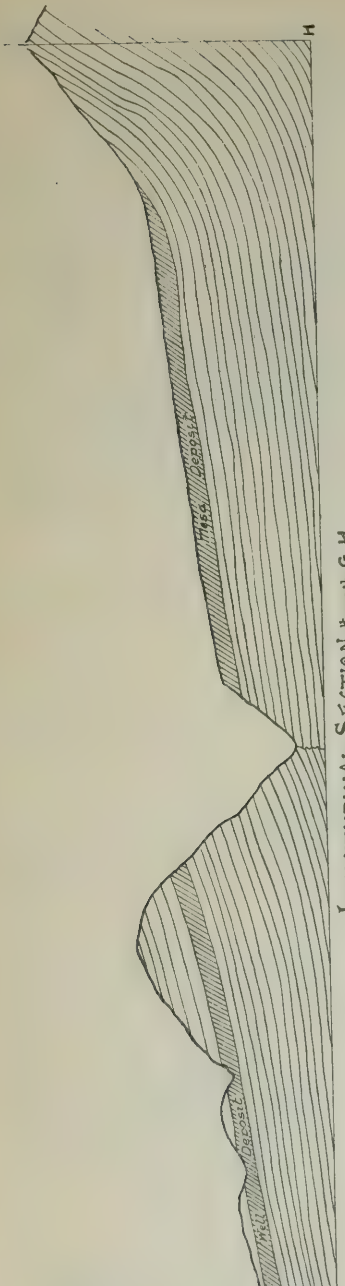
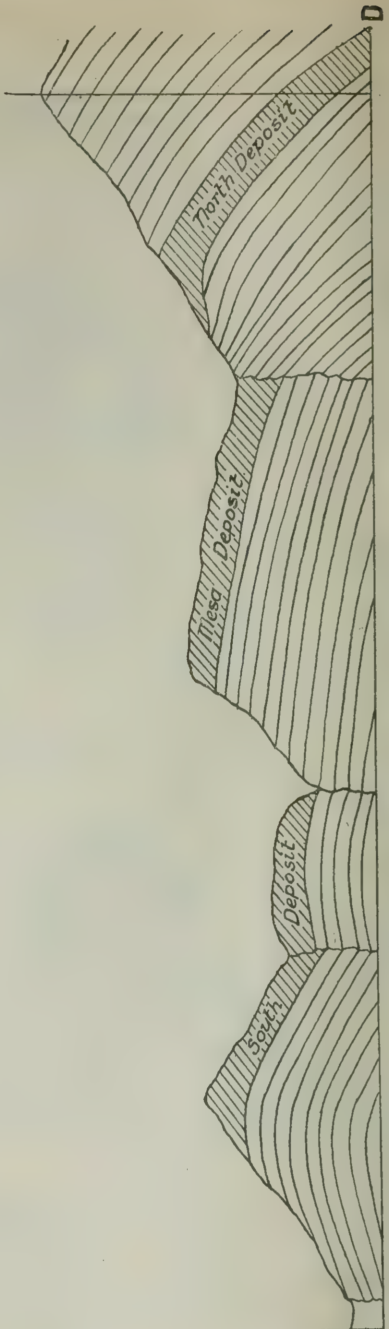


LONGITUDINAL SECTION through G.H.



CROSS SECTION through C. D.

In the extracted bitumen there is:

Retinoid (petrolene)	64.15%
Retene (asphaltene)	35.85
	100.00

There is also in the extracted bitumen:

Free sulphur	None.
Combined sulphur	0.60%

Eight men are employed. Consolidated Asphalt Co., owner; G. B. Hanaman, of 207 S. Broadway, Los Angeles, secretary.

Santa Clara County.

Sargent's, J., Tar Springs.—Fully described in our VIIth, VIIIth, and Xth Reports, pp. 93, 548, and 607. Asphaltum and brea occur on Sargent's ranch, near Sargent's station, about 6 miles S. of Gilroy. It is a superficial deposit from petroleum springs, and said to cover about 60 acres. Idle, and said to be "dead rented."

Santa Cruz County.

The vast deposits of bituminous rock lie in the foothills facing the coast, west and a little north of the City of Santa Cruz. They occur, for the most part, in almost horizontal massive strata, which crop out on steep slopes of hills, covered here and there by light-colored shales and the debris resulting from their disintegration. They have been extensively eroded, and now lie in large irregular fragments, distributed over a large area. Masses of bituminous rock in vein-like deposits also exist in places. The rock is as irregular in character as it is in distribution, but we may safely predict, from the present developments, that the commercially valuable bituminous rock will not be exhausted for many years. The methods of mining by all companies is essentially the same.

Baldwin Mine.—See our XIIth Report, p. 28. It is in the head of a narrow cañon on the Baldwin ranch, 5 miles N.W. from Santa Cruz and 2 miles from the coast, at 500′ elevation. The 10′ stratum of bituminous rock exposed is overlaid by a heavy bed of light-colored shales. A good road has been made from the mine to the county road on the coast. Idle. L. K. Baldwin, of Santa Cruz, owner.

City Street Improvement Co.'s (Walrath) Mines.—See our XIIth Report, p. 29. This company owns a group of four mines, known as Nos. 1, 2, 3, and 4, which are about 12 miles N.W. of Santa Cruz and 3 miles from the coast, at 850′ elevation. Three of them are being worked and one is idle. The open cuts are in outjutting points of a hill. No. 1 is more than 300′ long, with a face 110′ high, which shows the following section:

Light-colored shales	60′
Massive bituminous rock	30′
Very soft sandstone	8′
Massive bituminous rock	12′

Underlaid by soft sandstone and shales.

The lower stratum of bituminous rock contains coarser sand than the upper one, in which the sand becomes finer as the top is approached. No. 2 is immediately E. of No. 1, and at about the same altitude. In it the stratum of bituminous rock is the same as the upper stratum of No. 1; the cut is 150′ long, and the stratum of bituminous rock is about 14′ thick, overlaid by 25′ of shale. No. 3 is S. of No. 2, and the stratum of bituminous rock is about 15′ thick, and is overlaid by 15′ to 20′ of shale; the cut is about 300′ long. No. 4 is immediately N. of No. 2, at about 900′ altitude; the cut is about 75′ long, and shows a stratum of bituminous rock about 30′ thick, which is overlaid by about 15′ of shales. The bituminous rock in mines Nos. 1, 2, and 3 is generally "soft," while that in No. 4 is harder. The rock is mined by first stripping off the shales, then boring a series of holes 10′ to 20′ deep along the face; after "springing" them with a high explosive, they are charged with black powder and fired simultaneously by electricity. It is not unusual to throw down 500 tons at a single blast. The rock is then broken up into suitable sizes for handling, carefully assorted, and hauled to Santa Cruz for shipment. There were employed 15 men in mining and 45 in teaming. W. E. Dennison, Secretary, Mills Building, San Francisco; Williamson & Garrett Co., of Santa Cruz, manager.

Consolidated Bituminous Rock Co.'s (Thurber) Mine.—See our XIIth Report, p. 29. It is N. of and adjoining the property of the City Street Improvement Co., at 950′ altitude. It is worked by two large cuts, about 200′x 300′. The stratum of bituminous rock is 10′ to 30′ thick, and overlaid by shales. The rock is generally harder than that of the other mines in the vicinity, and occupies a higher stratigraphic position. It is not of uniform hardness, however, as both hard and soft varieties occur. Worked irregularly, depending on the demand. F. C. Lewis, secretary, Phelan Building, San Francisco; Williamson & Garrett Co., of Santa Cruz, manager.

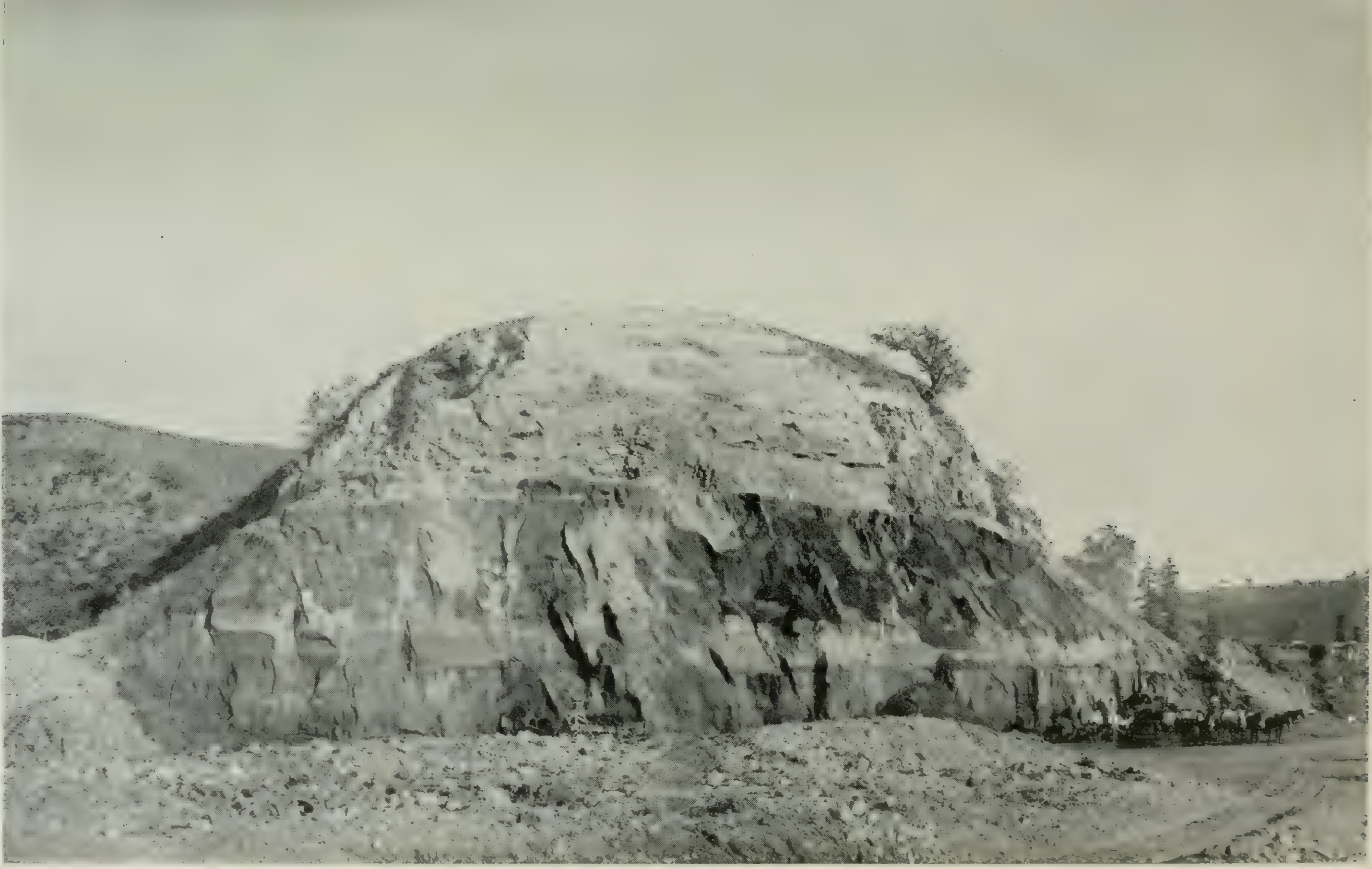
Cowell Mine.—See our Xth and XIIth Reports, pp. 621 and 28. It is about 12 miles from Santa Cruz and ½ mile E. of the City Improvement Co.'s mines, at about 800′ elevation. There are two cuts in the steep slope of a hill, which are about 200′ and 300′ long, respectively, and have a face 30′ to 50′ high. The bituminous rock stratum is 12′ to 20′ thick, and is overlaid by a heavy bed of light sandy shale, which caves into the cuts and causes considerable "dead work." This deposit is extensive, but is only developed to a limited extent. The mine was idle during the greater part of 1895, but work was resumed in the latter part of that year. The rock is generally rich in bitumen, and the sand which it contains is largely white quartz. Fragments of shells and bones are of rather common occurrence. There are 12 men employed in mining and 13 in teaming. Henry Cowell Lime Co., of San Francisco, owner; E. V. Cowell, of Santa Cruz, superintendent.

Enright Mine.—See our XIIth Report, p. 29. It is 9 miles W. of Santa Cruz, and 1 mile from the coast, at 450′ altitude. It is worked by an irregular open cut, about 100′x 200′ and 25′ deep. The bituminous rock is rather hard, about 15′ thick, and is overlaid by about 10′ of shale. Idle. J. D. Enright, of Santa Cruz, owner.

Ventura County.

Brea Cañon Mine.—It is in the Cañada del Laga, and about 5 miles N. of Ventura. The developments consist of a 50′ tunnel, partly caved, and a 50′ incline. At the mouth of the tunnel a vein of smooth black asphaltum shows a thickness of about 2′, and is said to contain about 40% asphaltum. The vein dips about 42° S.E. The wall rock is tough clay, containing fossils. W. R. W. Weldon, of Ventura, owner.

Cañon del Diablo Mine.—See our Xth Report, p. 763. It is about 5 miles N.W. of Ventura. Ventura Asphaltum Co., of Ventura, owner.



Bituminous Rock Quarry of City Street Improvement Company.

Ojai Mine.—It is about 17 miles E. of Ventura and 3 miles E. of Nordhoff. It is said that the formation is light-colored shale and that the asphaltum is a very heavy, viscous bitumen. Ojai Asphalt Co., owner; J. S. Briggs, of Ventura, manager.

Punta Gorda Mine.—See our XIIth Report, p. 33. It is about a mile E. of Rincon Creek and less than $\frac{1}{4}$ mile N. of the S. P. R. R., at about 150′ altitude. The workings consist of a 140′ tunnel and a 100′ shaft. The tunnel cuts through a vein of asphaltum which strikes S. 20° W., and dips 75° S.E. The vein in the tunnel varies from 10″ to 2′ in width. The wall rock is bituminous shale. At the mouth of the tunnel the shale is much disturbed, and in the tunnel it shows a dip of S. 30° W., at an angle of about 70°. The prevailing dip of the formation north of the tunnel is N. 10° E., and at an angle of about 80°. The shaft has been sunk on the vein, which is 13′ in maximum thickness. The asphaltum is a uniformly black mass, which exhibits a slightly granular structure. The following analyses are from the records of the company:

Asphalt from the 40′ level; by Geo. E. Colby, Professor of Chemistry, University of California, Berkeley:

Loss at 212° F.	0.83%
Hydro carbon	18.06
Fixed carbon	10.44
Fixed carbon in asphaltum	36.66
Total asphaltum	28.06
Ash	70.67

Asphalt from the 60′ level; by C. A. Ogden, chemist:

San Francisco, Cal., November 27, 1893.

The sample of bituminous rock contained:

Bitumen	28.53%
Silica	51.64
Clay	4.76
Sulphate of lime	2.45
Carbonate of lime	11.96
Carbonate of magnesia	0.55
Not determined	0.11
Total	100.00

The pure bitumen showed the following condition when treated at various temperatures:

Loss of oils at 212° F.	2.65%	
Loss of oils at 212° to 480° F.	6.95	
		9.60%
Loss of oils above 480° F.	40.72%	
Carbon	49.68	
		90.40
Total		100.00

Punta Gorda Asphalt Mining and Paving Co., of Santa Barbara, owner.

Rincon Mine.—See our XIIth Report, p. 33. It is situated on the Rincon ranch, about $1\frac{1}{2}$ miles N.E. of the Punta Gorda Mine, and at about 900′ altitude. At this point the soft Pliocene sandstones rest nonconformably on the bleached shales. The workings consist of a tunnel and an open cut. The tunnel has been run N. 80° E., and cut through a body of sand about 4′ thick, which is impregnated with heavy oil. The walls of the tunnel are soft sandstone, containing fossils. About 50′ S.E. from the mouth of the tunnel there is an open cut about 10′ deep, which shows a body of impure asphaltum, and appears to be an extension of the body of oil-soaked sand and asphaltic material cut in the tunnel.

BORAX.

Inyo County.

Conn & Trudo Borax Works.—They lie in Salinas Valley, 18 miles N. of Keeler. The firm controls about 700 acres, part of which is covered with a crust of crystallized tincal from 6″ to 2′ thick, which contains 90% borax. The crude material is dissolved in boiling water and drawn off in tanks, where the impurities settle and the borax crystallizes out. Conn & Trudo, of Big Pine, owners.

Salt Wells Borax Works.—See our XIIth Report, p. 34. They are in Salt Wells Valley, 60 miles S. of Keeler, and lie both in Kern and San Bernardino counties. The property consists of 2,000 acres of land in a body. About 100 acres are covered with a crust, 3″ to 10″ thick, of sulphate of soda. The rest contains "cotton balls," or *ulexite*. An analysis of the borax made by Prof. Price gives the following:

Insoluble	1.40%
Water	44.80
Sodium chloride	16.28
Boracic acid	36.83

It contains 0.4% of "prismatic borax." Judge A. V. Davidson et al., of Independence, owners.

Lake County.

It is found at Borax Lake. See our Xth Report, p. 237. The borax existing in the bed of the lake was exhausted, and the large works erected to extract borax from the mud of the lake proved a failure.

San Bernardino County.

The borax industry in this county is not conducted on as vigorous a scale as formerly. The large production of colemanite from the mines in East Calico has apparently lowered the market price of borax, and resulted in closing the works on the dry lakes in the northeast corner of the county. Only assessment work has been done on claims near Calico not owned by the Pacific Coast Borax Co.

Pacific Coast Borax Co.'s Mines.—See our IXth, XIth, and XIIth Reports, pp. 225, 345, and 35. They are 5 miles E. of Calico, at 3,000′ elevation. These vein-like deposits are of considerable extent, and appear to consist of two separate veins 40′ apart. They have been opened at numerous points for a distance of nearly 5 miles in an E. and W. direction. The sedimentary beds in which the deposits are found are folded and faulted, and also intruded by dikes of liparite and hornblende andesite breccias. Several new prospecting shafts are being sunk with windlass, gasoline-engine, and horse-whim. These deposits have been mined continuously for a period of ten years, and the deepest workings are now 500′ from the surface. The calcium borate is hauled in wagons 12 miles to Daggett, and from there shipped by rail to the company's works in Alameda. Pacific Coast Borax Co., owner; J. W. S. Perry, of Daggett, superintendent.

Stevens & Greer Mines.—See our XIIth Report, p. 35. They are situated along the southeastern side of the Calico range, 5 miles E. from the village of Calico. The numerous claims have only superficial development, and are idle. They are located, not on colemanite deposits, but on upturned strata of indurated mud containing calcium in finely disseminated crystals. Stevens & Greer, of Calico, owners.

The Owens Mines.—See our XIIth Report, p. 35. They are 5 miles N.W. of Daggett and 6 miles S.W. of Calico. Geologically they are similar to the Stevens Mine, near Calico, viz.: an uplift of argillaceous strata impregnated with calcium borate. Judge A. J. Owens, of Daggett, owner.

CHROMIC IRON.

Alameda County.

The important industries of this county consist of fruit-growing, stock-raising, agriculture, and miscellaneous mineral industries. Macadam is produced in the foothills near Oakland and Haywards; manganese in the southwestern part of the county. The potteries and salt industry near the bay are important sources of revenue. The chromic iron mines about Cedar Mountain, and the sandstone quarries near Niles, are temporarily idle. The county possesses superior shipping facilities, both by water and by rail.

Since our last report the chromic iron claims have all been idle, on account of the low price of the material mined and the distance from market.

Douglas Mine.—See our XIIth Report, p. 36. It is on Cedar Mountain, 12 miles S.E. of Livermore. Idle. D. Mendenhall, of Livermore, owner.

Mendenhall Mine.—See our XIIth Report, p. 36. It is on the S.W. side of Cedar Mountain, 13 miles S.E. of Livermore. Considerable good ore is said to have been obtained from it. Idle. A. Mendenhall, of Livermore, owner.

Calaveras County.

Chromic iron occurs 10 miles N.E. of Milton, on the ranch of Capt. John Wright, in Salt Spring Valley, in the serpentine belt which skirts the western base of Bear Mountains. A similar deposit is found on the Tower ranch, near the Angels stage road, 9 miles E. of Milton. Very little work has been done on either of these deposits.

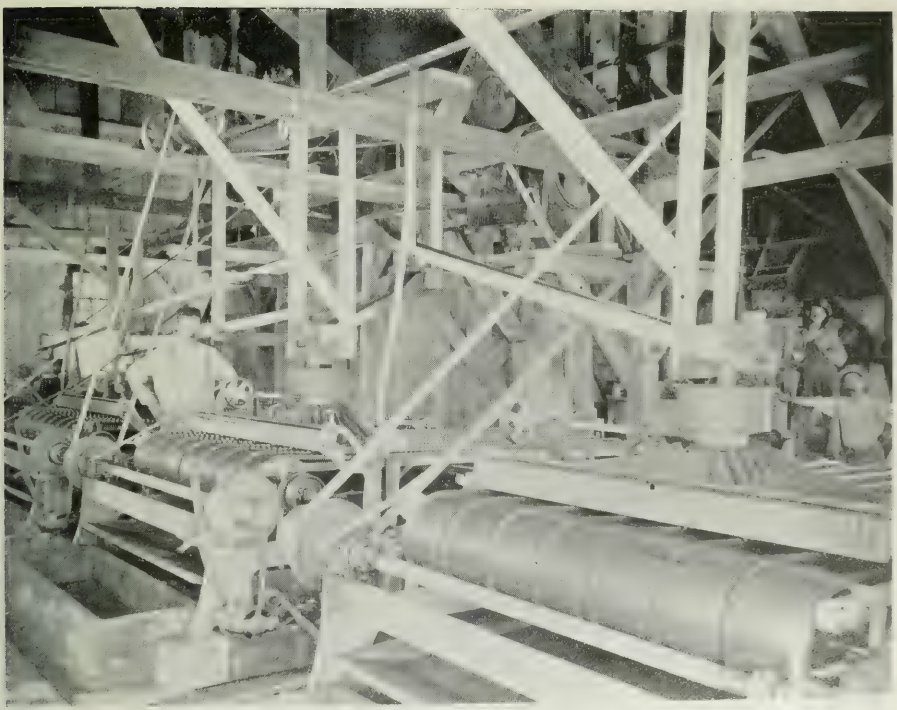
Del Norte County.

Large deposits of chromite are found in the Rattlesnake Mountains, from Bald Hill to the Klamath River, imbedded in the serpentine country rock. They are not located, as the cost of transportation is too great to make their working profitable at present.

French Hill (*Tyson*) *Mines.*—See our Xth and XIIth Reports, pp. 167 and 36. They lie at French Hill, 3 miles S. of Gasquet, in Sections 5 and 6, T. 16 N., R. 1 E., H. B. M., at 1,750′ to 2,000′ altitude. The company owns some 900 acres of land, on which chromite is found as kidneys imbedded in serpentine. The large deposits have been cut and wagon roads built to them. Idle. Tyson Mining Co., of Baltimore, Md., owner.

Low Divide (*Tyson*) *Mine.*—See our Xth and XIIth Reports, pp. 167 and 36. This property lies on Low Divide Mountain, 8 miles E. of Smith River P. O., at 2,460′ altitude. A large body of ore is exposed by several open cuts. Idle. Tyson Mining Co., of Baltimore, Md., owner.

San Luis Chrome Works—Exterior View.



San Luis Chrome Works—Interior View.

Fresno County.

Chromite occurs in the serpentine belt, 6 miles S.W. of Toll House.

Mendocino County.

Chromite of good quality is found in several places in the hills west of Russian River Valley. The individual deposits are not large, but there are quite a number of them. Efforts are being made to develop the mines.

Napa County.

Deposits of chromite occur in the range east of Napa, in Pope and Chiles valleys, and near St. Helena.

San Luis Obispo County.

Chromite occurs in many places in the Santa Lucia Mountains in the northwestern part of the county, principally in small bunches, seams, etc., penetrating zones of serpentine; a large part of the ore produced has been taken from superficial debris. Numerous claims have been taken up, and worked intermittently, but the ore is too low-grade or scattered to be systematically and profitably worked at present prices, viz., about $8 per ton. The following claims have produced to date about 17,860 tons, and are fully described in our VIIIth, Xth, and XIIth Reports, pp. 351, 582, and 37:

Arroyo de la Rodilla.
Castro.
El Devisadero.
El Salto.
Estrella.
Guadalupe.
Jasper.
Kaolin.
La Trinidad.
La Flor.
Las Amigus.
Little Salto.
Lone Pine.
London.
Mono.
New Magdalen.
Old Magdalen.
Pick and Shovel.
Primera.
Rodilla.
San Carpojoro.
San Theresa.
Soledad.

There are no new developments.

The San Luis Chrome Company has concentrating works, and purchases such ore as is offered, which it concentrates and ships to Baltimore. Four men are employed. Mr. H. G. Shaw, of San Luis Obispo, manager.

Santa Clara County.

It is an exceptionally fertile county; every variety of fruit and cereal produced in the State is grown within its borders, and usually in large quantities. The broad Santa Clara Valley, which stretches N.W. and S.E. across the county, occupying almost one half its area, is especially well suited for horticulture and agriculture. Subterranean water is prevalent and part of the wells are artesian. The principal mineral products are quicksilver, building-stone, and petroleum, though many other minerals occur, which are of more or less economic importance, as manganese, magnesite, limestone, lignite, mineral waters, etc.

Chromic iron occurs in bunches and seams in the serpentine in the southern part of the county, but is developed only to a very limited extent, and is generally too thinly disseminated or too low grade for its exploitation.

Greenwall's, T. B., Mine.—It is in the foothills W. of the S. P. R. R., 16 miles S. of San José, at about 1,100′ elevation. It consists of surface workings and a tunnel 60′ long. A few tons of fair ore lies on the dump. It occurs in bunches of serpentine.

Shasta County.

Hull & Jones Mine.—It is in T. 3 N., R. 4 W., on Shotgun Creek; the chrome-iron deposit is over 20′ thick, and only worked on demand. A good wagon road 1¼ miles long connects with the C. & O. R. R. Several carloads extracted by 4 men have been shipped. Three miles beyond is a second deposit. Sylvester Hull and T. N. Jones, of Hazel Creek, owners.

Sierra County.

Brandy City.—Chromic iron is found on Sec. 1, T. 19 N., R. 8 E.

Sonoma County.

An unlocated deposit of chromite exists 3 miles W. of Geyserville, south of the wagon road. Another one is found on the land of the Asti Colony, 3 miles S. of Cloverdale. A tunnel was run under the deposit with a view of finding a vein. The nature of such deposits not being understood, no vein was found, and the work abandoned. Some years ago 2,500 tons were shipped from here.

Tehama County.

This county, situated in the upper part of the Sacramento Valley, and extending on both sides of it far into the mountains, comprises valley, foothill, and mountain lands, used principally for agricultural, horticultural, and grazing purposes. The annual rainfall is large, and the important streams afford ample water for power, irrigation, and domestic purposes. Good water may be had in the Sacramento Valley from wells 15′ to 125′ deep. Mineral springs are abundant, some of which are widely known for their medicinal properties. The lumber industry is an important source of revenue. Chromic iron, "pectolite," indications of oil, and coal occur in the western part, while in the eastern part the sedimentary rocks, probably auriferous, are covered by lava.

Tehama County Chrome Deposit Co.'s Mine.—See our Xth and XIIth Reports, pp. 692 and 38. It is situated on the North Fork of Elder Creek, in Sec. 16, T. 25 N., R. 7 W., about 28 miles W. of Red Bluff, at 2,000′ elevation. During 1895 the company mined and shipped 1,500 tons of ore, making a total of 4,500 tons that this deposit has yielded to date. It averages 47% chromium, and sells for $9 per ton, f. o. b. at Red Bluff. There are 18 miners and 31 teamsters employed intermittently. On the company's ground are also deposits of magnesite and a ledge of pectolite, besides indications of coal. Tehama County Chrome Deposit Co., of Red Bluff, owner.

COAL.

Alameda County.

Corral Hollow Mine.—See our Xth and XIIth Reports, pp. 91 and 39. All information and admittance to the mine was refused our Field Assistant. A standard-gauge railroad from Stockton to the mines was completed June 10, 1896.

Amador County.

Coal Mine No. 3.—See our XIIth Report, p. 41. It is 3 miles in a northwesterly direction from Ione. The inclined shaft, in July, 1895, reached 160′ in depth. The third stratum of coal is the one being exploited. Shafts and bore-holes sunk in this region show the country to be underlaid by an extensive stratum of this brown lignite, but Mine No. 3 is the only one at present in operation. The shipment for 1895 was 21,323 tons. Thirty-eight men are employed. Ione Coal and Iron Co., owner; Frank Frates, of Ione, superintendent.

Contra Costa County.

It is principally an agricultural, fruit-growing, and stock-raising county, though a large part of its revenue is derived from its coal and other mineral industries. It contains important springs, which are noted for their medicinal properties. There has been more or less prospecting for gold and copper about Mount Diablo, and small quantities found, but their exploitations have not been profitable.

Central Mine.—See Stewart.

Empire and Hartley Mines.—See our VIIth and XIIth Reports, pp. 142 and 44. They are in Sec. 12, T. 1 N., R. 1 E. Idle.

Mount Diablo Coal Field.—See our VIIth and XIIth Reports, pp. 118 and 43. The Pittsburg Mining Co.'s mines at Somersville, and the Stewart Mine at Stewartsville, are the only mines in operation.

Pittsburg Mining Co.'s (Somersville) Mines.—See our VIIIth and XIIth Reports, pp. 160 and 44. They are at Somersville, and consist of the *Eureka*, *Manhattan*, *Pittsburg*, and *Union*. The Pittsburg Mine is worked by an 8′x 12′ double-compartment vertical shaft, 600′ deep. It cuts the Clark bed of coal at a depth of 300′, the "Little" bed at 450′, while the Black Diamond bed is supposed to lie 100′ below the bottom of the shaft. A cross-cut runs north from the bottom of the shaft and cuts the "Little" bed 200′ from the shaft, and at 600′ cuts the Clark bed. A gangway runs 210′ W. from the cross-cut on the "Little," and another 500′ E. on the Clark bed. The coal is mined from above and lowered through chutes to the gangways. Sheet-iron is used in the chutes on which to slide the coal. The beds dip uniformly 31° N. The "Little" bed is 2½′ thick and carries varying quantities of carbonaceous shale-bone.

The coal of the "Little" bed extends 300′ above the gangway, while in the Clark bed it has been mined to within about 150′ of the gangway. The Clark bed is uniformly 3½′ thick, inclosed between beds of sandstone, and is quite free from slate, etc. Though a large amount has been mined from this bed in the old workings above water-level, the beds extend E. ¾ mile or more on the company's property, and a vast quantity may yet be obtained. It is principally used for steam purposes on boats, factories, etc. A narrow-gauge railroad conveys the coal from the mine to Pittsburg Landing. The water is allowed to accumulate in lower parts of the mine, and hoisted through the shaft in 500-gal. tanks by a new engine used only for that purpose. About 8 hours per day is required for hoisting water. Since our last report the "Davis" slope has been producing about 1,000 tons per month from the Black Diamond bed, but is now temporarily idle. The company employ 60 men in mining and 20 on the surface. James Rankin, of Martinez, superintendent.

Star Mine.—See our XIIth Report, p. 46. It is in Sec. 1, T. 1 N., R. 1 E. Idle.

Stewart (*Central*) *Mine.*—See our VIIth and XIIth Reports, pp. 141 and 48. It is on the steep side of a ridge at Stewartsville, at about 500′ elevation. Since our last report the cross-cut on the 1,200′ level has been continued north to the Belshaw bed, 400′ from the bottom of the slope, from which point a 180′ slope has been sunk, following the coal-bed, which dips 25° N. A two-horse-whim is used to hoist cars up the slope to the 1,200′ level. Also, considerable coal has been mined on the 900′ level from a bed which overlies the Black Diamond, and is separated from it by 4′ to 5′ of black shale. It consists of alternate layers of coal and shale, of which the following is a section at the breast of the gangway:

Coal	7″
Bone	12″
Coal	15″
Bone	10″
Total	3′ 8″

The coal is said to be improving as developing progresses. This coal has a tendency to ignite when stored for a time in bulk, and is therefore better used when fresh. The Belshaw bed is 2′ 8″ thick at the bottom of the slope, and the coal is comparatively free from bone. The coal is conveyed to Antioch by rail. Thirty-two men are employed intermittently. M. W. Belshaw, of Antioch, owner.

Del Norte County.

On the beach, ½ mile S. of Point St. George and 3 miles N. of Crescent City, coal is said to crop out and be visible when the sand is low and the tide out. A large detached piece, lying on the beach, is a true lignite similar to that found all along the coast in recent sandstones. The dip is inland. Borings 1,000′ back from the shore penetrated a vein 3′ thick. The coal has no commercial value; its position makes mining too costly. Peter Emetsberg, of Crescent City, owner.

Fresno County.

California Mine.—See our XIIth Report, p. 50. It is in the Coalinga coal field, in Sec. 22, T. 20 S., R. 14 E., 5 miles N.W. of Coalinga, at about 1,300′ altitude. Since our last report a 400′ slope has been run from the old tunnel, near its mouth, cutting the "little" vein, said to be 2′ 9″ thick, and harder than near the surface. The lower workings are now full of water. Idle. R. Ballentine, of Coalinga, superintendent.

Carey Creek Coal.—See our XIIth Report, p. 51. No recent developments.

Del Monte (*Drabble*) *Mine.*—See our XIIth Report, p. 51. It is near the head of a narrow cañon in the Priest Valley coal field, 20 miles W. of Alcalde, near the western boundary of the county, at about 2,400′ altitude. Since our last report the old tunnels and road leading to the mine have been repaired, a boarding-house for miners built, and a new 390′ tunnel run: it starts in a steep ravine, 125′ below the "second tunnel," runs N. 10° E., and penetrates the following strata, which dip 68° N.:

Soft gray sandstone	200′
Light-blue compact clay	52′
Coal bed No. 1—Carbonaceous shale and seams of coal	4′
Soft gray sandstone and shales	28′
Gray compact argillaceous shale	7′
Coal bed No. 2—Coal and seams of shale	3′
Sandy shales passing into clay shales	96′
Total	390′

The breast of the tunnel is probably near coal bed No. 3. Coal bed No. 1 contains too much shale (bone) to be of any economic importance. Bed No. 2 is as follows:

Clear coal	12″
Bone, carbonaceous shale	5″
Clear coal	14″
Bone, carbonaceous shale	5″
Total	36″

The coal of this bed looks well where penetrated by the tunnel, but is said to crumble more or less after it is mined. Bunkers are to be erected below the mouth of the above tunnel. Two men are employed developing. Del Monte Coal Mining Co., owner; R. S. Falconer, of No. 1189 Market Street, San Francisco, secretary; R. S. Nelson, of Warthan, superintendent.

San Joaquin Valley Co.'s Mine.—See our Xth, XIth, and XIIth Reports, pp. 186, 217, and 52. It is at the head of a narrow ravine, 4 miles N.W. of Coalinga, at about 1,200′ altitude. The developments consist of three tunnels, 300′, 400′, and 1,700′ long, respectively, and a 300′ slope. They are inaccessible, having caved somewhat, and are full of water. The bed of coal worked is said to average 4′ thick, and is comparatively poor. A branch railroad runs from Coalinga to the mine. Idle. E. Kauntz, of Hanford, manager.

Humboldt County.

In our XIIth Report, pp. 54–56, several discoveries of coal were mentioned, and their occurrence described in detail. The coal found near Hydesville and on Maple Creek will probably prove to be commercially valuable, but no work has been done at either place since 1893.

Los Angeles County.

Carbon Hill Oil and Coal Co.—See our IXth Report, p. 204. Assessment work only. A. S. Longley, of No. 338 S. Broadway, Los Angeles, president.

Mendocino County.

Eel River Mine.—Fully described in our XIIth Report, p. 57. It is situated on Middle Fork of Eel River, 4 miles N. of Carey. A new railroad survey was made in the summer of 1894 from Fort Bragg, passing the mine to Round Valley, and the promoters expect to start building in the immediate future. Fort Bragg Lumber Co., San Francisco, agents.

Round Valley.—See our XIIth Report, p. 58.

Thomas Mine.—See our XIIth Report, p. 58. It lies on Salt Creek, 2½ miles N. of Carey. Idle.

Monterey County.

Coal crops out in a number of places in this county, and some development work was done a few years ago, but no coal is now being produced.

Carmel Mine.—See our VIIIth and Xth Reports, pp. 414 and 347. It is about 14 miles S. of Monterey and 2 miles from the coast, at 1,000′ altitude. It is said that there are three beds of good coal in the mine, and that 20,000 tons have been mined. The workings are inaccessible. Idle. A. Bassett, of Pacific Grove, superintendent.

Priest Valley Coal Fields.—See our XIIth Report, p. 59. It is in the southeastern part of the county. A number of beds of coal outcrop and extend S.E. into Fresno County. The coal is in a sandstone and shale formation, and dips 40° N.E. It is too far from shipping facilities to be of economic importance at present.

Stone Cañon.—See our VIIth, VIIIth, and XIIth Reports, pp. 172, 403, and 59. It is in the southern part of the Priest Valley region, and 20 miles N.E. of San Miguel. A thick bed of coal is said to exist there, which is hard enough to stand handling. Some development work was done a few years ago. Idle.

Riverside County.

Elsinore (*Chaney*) *Coal Mine.*—See our XIIth Report, p. 60. It is 6 miles W. of Elsinore. The mine is in operation, but not producing as largely as formerly, owing to decreased demand, petroleum having superseded coal as fuel to a large extent in Southern California. Elsinore Coal and Clay Co., of Los Angeles, owner; D. W. McCrea, of Elsinore, superintendent.

San Benito County.

Coal outcrops in a number of places in the southern part of this county, but at present is too great a distance from shipping facilities to be economically important.

Oat Cañon.—See our XIIth Report, p. 61. In T. 19 S., R. 11 E., in the southern part of the county, coal outcrops in a number of places, and a 5′ bed of inferior quality is said to have been struck in a tunnel a few years ago. No recent developments.

San Benito (*Trafton*) *Mine.*—It is in San Benito Valley, Sec. 21, T. 17 S., R. 10 E., 45 miles S.E. of Hollister, and at about 2,600′ altitude. The bed of coal is 4½′ thick at the surface, and said to be 6′ in the bottom of the 130′ shaft. It is overlaid by brown ferruginous shale, and underlaid by massive, soft, brown sandstone, dipping 32° N.W. It has a tendency to crumble by handling, and is suitable for fuel only, principally for steam purposes where stationary boilers are used. It is said to have been tested at the pumping plant of the Hollister waterworks, and found to be equal to the best coal in the market for steam purposes. The mine is worked by an incline shaft, 130′ deep; now full of water. Idle. G. Nash, of Hollister, owner.

Shasta County.

Cow Creek.—In Sec. 12, T. 33 N., R. 2 W., there is a coal outcrop about 20′ thick, including the intermediate thin clay seams; the largest seams are 2½′ and 15″ thick, and of a fair quality.

Near *Eiler's* place, N. of Little Creek, are coal exposures.

Siskiyou County.

Seven miles S.E. of Glazier, on the Sisson and Fall River Mills stage road, at the headwaters of Kosk Creek, 2 miles below the forks, in unsurveyed T. 38 N., R. 1 E., M. D. M., lies an isolated area of sandstone, 4 miles by 2½ miles in extent, carrying several beds of coal. One, about 4′ in thickness, crops out along the right bank of Big Cañon or Kosk Creek for a distance of nearly 2 miles. A second bed, 5′ thick and about 150′ above, crops out and crosses Colby Creek, a feeder to Kosk Creek. Other smaller seams and outcrops are visible in this section. These beds have a sandstone roof and clay floors, and dip about 15° into the mountain. The lower bed lies at 3,350′ approximate elevation; 3,500′ at the upper outcrop; and 5,325′ at the top of the sandstone where it flanks on the McLoud Mountain. About twenty-four claims have been filed on these lands. With exception of a 15′ tunnel on the A. D. Bartle claim, no developments worth mentioning have been made.

Four miles W. from Ager, on the C. & O. R. R., at 1,400′ approximate elevation, on Mrs. Wise's land on the southeastern slope of Black Butte Mountain, are 140 acres that show a 34″ vein of coal, under sandstone. Some work was done here several years ago, but as the coal was found to contain an excess of ash, no further developments have been made. Mrs. W. Wise, of Ager, owner.

Siskiyou Coal Mining Co.—See our XIIth Report, p. 61. It is on Willow Creek, about 4 miles E. of Henley. Idle. D. Horn, of Hornbrook, president.

Sonoma County.

No mines are being worked in the county, although a number of coal seams are known. See our XIIth Report, pp. 61–62.

O'Donnell's Mine.—This mine, so much heralded in the newspapers, lies ½ mile W. of Glen Ellen, and proves to be nothing but a seam of black clay, colored by carbonaceous matter.

Sutter County.

See our Xth and XIth Reports, and Bulletin No. 3, pp. 691, 471, and 9.

A limited quantity of coal is said to have been obtained from seams and pockets in shales which flank the Marysville Buttes, but there have been no recent developments.

Trinity County.

A 4½′ stratum of a soft, fat lignite, highly valued by the miners, has been uncovered by the mining operations in the Wiltshire hydraulic claim, at Big Bar P. O. It appears to dip 20° N., and under the river. The cropping is exposed for 200′, and it will not exceed probably more than a few acres in extent.

Hay Fork Valley Coal Field.—See our XIIth Report, p. 62.

Hyampom Valley.—See our XIIth Report, p. 62.

Poison Camp.—See our XIIth Report, p. 63.

COPPER.

Amador County.

Newton Mine.—Fully described in our VIIIth Report, p. 106. It is 4 miles N.E. of Ione, on the road to Jackson, at 650′ elevation. The average width of the vein is 7′ to 8′, and it courses a little E. of N., and dips 62° easterly. There are two shafts upon the property, 430′ and 150′ deep. Hoisting works, etc., gone to decay. Idle.

Calaveras County.

The copper industry of this county is still practically at a standstill. At the Campo Seco and Copperopolis mines the leaching of the old ore-piles is the only work in progress. It was expected that with the improvement in price, mining operations would be resumed, but as yet nothing in this direction has been done.

Campo Seco Mine.—See Penn Chemical Works.

Hecla (Copper Hill) Mine.—See our VIIIth Report, p. 156. It is 2 miles N.W. of Campo Seco, and adjoins the Campo Seco Mine on the north. Idle.

Penn Chemical Works or Campo Seco Mine.—See our VIIIth Report, p. 152. It is 1½ miles N.W. of the village of Campo Seco. Leaching old ore-piles only. Penn Chemical Works, of San Francisco, owner; C. Borger, of Campo Seco, superintendent.

San Francisco Mine.—See our VIIIth Report, p. 156. It is 1 mile N.W. of Campo Seco, adjoining the Campo Seco Mine on the south. Idle.

Union (Keystone) Mine.—Fully described in our VIIIth and XIth Reports, pp. 150–152 and 167. It is at Copperopolis. Idle. G. McM. Ross, of Copperopolis, superintendent.

Del Norte County.

Copper ores are found in this county in a belt of hard gray serpentine, a mile wide, which crosses the mountains in a N. and S. direction. It can be traced from Bald Hill to the State line, and far into Oregon. The principal discoveries were made thirty years ago near Low Divide, 10 miles E. of Smith River Corners and about 8 miles N. of Gasquet. The mines, after being worked extensively for several years, were shut down when the price of copper declined, and until recently have been idle.

Alta Mine.—See our Xth and XIth Reports, pp. 167 and 198. This property lies on the divide between Hardscrabble and Rowdy creeks, 10 miles E. of Smith River P. O., at 2,000′ altitude. It has been worked extensively in former years, the deepest workings being 700′ below the surface. Idle. Bacon & Co., of San Francisco, owners.

Aurora Mine.—This lies E. of the Alta, at 2,050′ altitude, and is a new location on the old Copper Hill property. The country rock is gray serpentine. The new shaft is 70′ deep, and shows a vein of rich sulphurets of copper and iron, 6′ thick. It courses N.E. and S.W., and dips 45°. The hillside below the croppings of the vein is littered with ore rich in oxide of copper, and said to assay 40% copper. Idle. D. R. Miller, of Crescent City, owner.

Aurora Extension Mine.—It lies N.E. of the Aurora, at 2,100′ elevation, and is also a new location on the Copper Hill property. Some shallow surface work exposes a 6′ vein, carrying carbonate and black oxide of copper. Idle. A. B. Townsend, of Crescent City, owner.

Condon Mine.—See our Xth and XIth Reports, pp. 167 and 198. It is at Big Flat, 25 miles E. of Crescent City. Idle.

Occidental Mine.—It lies 10 miles E. of Smith River P. O., and S. of the Alta Mine, at 1,440′ to 1,650′ elevation. The property was relocated in 1895, and embraces the following claims: *Lookout*, *Lookout Extension*, *Pride of Del Norte*, and *Pride of the West*. The country rock is serpentine. The old workings, which are quite extensive, have caved. The present owners were engaged in cleaning out the shafts and drifts, and retimbering them where necessary. The vein courses N. and S., and dips 30° to 80° E. It is from 4′ to 12′ wide, and carries red and black oxides near the surface, which change to pyrite, tetrahedrite, and metallic copper below. John Murray et al., of Crescent City, owners.

Union Mine.—It is near the Occidental, and at 1,800′ altitude. The claim contains 20 acres, and was relocated in 1895. The owners were cleaning out and retimbering the old workings, which consisted of an 800′ cross-cut tunnel No. 1, with a 300′ drift on the vein; a 600′ cross-cut tunnel No. 2, and a 75′ shaft, all in ore. The vein courses N.E., dips about 50° E., and carries oxides and sulphides of copper. J. A. Murphy et al., of Crescent City, owners.

El Dorado County.

Cosumnes Copper Mining Co.'s Mine.—It is on the Middle Fork of the Cosumnes River, 4 miles E. of Fairplay, at 1,950′ elevation, and comprises four claims, two of which are patented. The vein, from 10′ to 17′ wide, strikes N. and S., and dips vertically between granite on the west and mica schist on the east. Beyond the mica schist wall is a belt of marble 500′ across. There is a 200′ tunnel, slightly caved at the entrance, which is being reopened. The vein carries "peacock" ore, malachite, copper-glance, molybdenite, also galena and other sulphurets. The general average of the ore is about 15% copper; choice specimens are said to yield 19 ozs. silver, $6 gold, and 50% to 52% copper per ton. Four men are at work. An incorporated company, of Placerville, owner; E. Bind, of Placerville, superintendent.

Fresno County.

Ackers Mine.—It is on Pine Flat, 10 miles S.E. of Letcher, at 1,500′ altitude. The vein is 8′ wide, dips 60° E., and lies between syenite walls. The ore is chalcopyrite and black oxide. Development consists of a tunnel 50′ long, and a shaft 36′ deep. Henry Ackers, of Sanger, owner.

Copper King Mine.—See our XIIth Report, p. 66. This is on Dog Creek, 5 miles S.E. of Letcher, at 1,540′ altitude. The vein is 5′ to 7′ wide, and consists of a solid mass of chalcopyrite with a little zincblende, galena, and about $5 in gold per ton. The dip is 40° E. The hanging-wall is hornblende schist, while the foot-wall seems to be a dike, altered to talcose slate. Near the surface the vein is filled with hydrous oxide of iron, not a trace of copper being visible. The developments consist of a tunnel 200′ along the vein, and a shaft 60′ deep. Idle at present, awaiting the erection of a pump and hoist. Hugh Knipper, of Letcher, owner; P. F. Jansen, of Letcher, superintendent.

Humboldt County.

Red Cap Creek Mine.—See our XIIth Report, p. 66. Abandoned.

Madera County.

The belt of copper mines lying in the lower foothills, and extending from Buchanan to Green Mountain, are still idle. These deposits occur as a mineralization of mica schist and other crystalline rocks. Copper, also, is found in considerable quantity in the mines of the North Fork Mining District, near the head of the San Joaquin River. See our XIth Report, p. 219.

Marin County.

Bolinas Mine.—See our XIth Report, p. 253. It lies 1 mile E. of Dogtown, at Bolinas Bay. This property, after lying idle many years, is being prospected by a shaft sunk in the bottom of Union Gulch. It is 35′ deep, shows a 12′ vein carrying sulphurets of copper and iron between walls of sandstone.

Mendocino County.

Native Copper Mine.—See our XIIth Report, p. 67. It lies on Red Mountain, 12 miles S.E. of Ukiah. No recent developments. C. H. Stout, of Ukiah, owner.

Salinas (*Red Buck*) *Mine.*—See our XIIth Report, p. 67. This property lies on Red Mountain, 15 miles S.E. of Ukiah, and consists of four full claims, viz., the *Igurnia*, *Leland*, *Ella*, and *Salinas*. The 3′ vein is well defined, strikes N.W., and dips 70° N.E. in serpentine. The ore shows metallic copper in sheets and grains; also, oxides and carbonates. The developments consist of a 20′ shaft and several open cuts. Dr. G. W. Stout, of Ukiah, owner.

Thomas Mine.—See our XIIth Report, p. 67. It lies on Bratt Ridge, 3 miles S. of Carey. Considerable prospecting has been done to find the vein. A tunnel, 100′ long, has been run into the ridge, but work was discontinued on account of expense. A trench was then started running up the hill until the soil became too deep for an open cut. Next, water was brought in through a ditch ¼ mile long, and the surface soil was, in 1895, being piped off with hose and nozzle under heavy pressure. The ore is a mass of sulphurets of iron and copper, nearly free from gangue. W. T. Thomas, of Ukiah, owner.

Nevada County.

Imperial Paint and Copper Co.—See our Xth, XIth, and XIIth Reports, pp. 392, 313, and 67. It is in Secs. 26 and 35, T. 15 N., R. 6 E., in Spenceville, at 575′ elevation, and comprises 214 acres. Since our previous report the large pit has been emptied of the water, exposing the large bodies of sulphide ore. The present output is 2 tons of cement copper per month, and 300 tons of paint. Seven men are employed. An incorporated company of No. 504 Kearny Street, San Francisco, owner; Otto Woehler, of Spenceville, superintendent.

Jackson Mine.—It is 2½ miles N.E. from Spenceville, at 750′ elevation, and comprises a full claim, adjoining the Mineral Hill. It is only a prospect with a 50′ tunnel. — Jackson, of Spenceville, owner.

Mineral Hill Mining Co.'s Mine (Quartz).—See our XIIth Report, p. 67. It is in Sec. 13, T. 15 N., R. 6 E., 2½ miles N.E. from Spenceville, at 750′ elevation, and comprises four claims, designated *Golden Eagle*, *Index*, *Legion*, and *Mineral Hill*. There are thirteen vein outcrops on the property having a strike of N. 26° W., and an easterly dip, and varying in width from 2′ to 30′. The front veins have been proved to carry a paying amount of gold with the predominating copper ores. On the Golden Eagle are six shafts and a tunnel; on the Index a tunnel, now being run, has attained 300′ in length with 170′ perpendicular depth at the breast. The deepest shaft is 200′ perpendicularly. Eight men are employed. An incorporated company of No. 210 Sansome Street, San Francisco, owner; C. C. Bitner, of Spenceville, superintendent.

Plumas County.

Cosmopolitan Mine.—See our XIIth Report, p. 68. Idle.

Engel Mines.—See our XIIth Report, p. 68. Assessment work only.

Pocahontas Mine.—See our XIIth Report, p. 69. Idle.

Riverside County.

Several copper prospects have been opened superficially in the low hills N.E. of South Riverside, and in the rugged brush-covered hills S.W. of the town. The ore is very low grade. J. Irving Crowell, of South Riverside, owner.

San Bernardino County.

Amazon Mine.—See our XIth and XIIth Reports, pp. 363 and 69. It is 5 miles E. of Oro Grande, and has a 65′ shaft, some drifts, and several superficial cuts. Only assessment work is done. Estate of H. Easton, of Oro Grande, owner.

Copper Bullion Mine.—It is 1½ miles W. of Manvel, at 5,000′ elevation. The ore-shoots are extremely irregular in shape and size, and occur in limestone. The ore is chiefly chrysocolla and chalcopyrite. An incline has been sunk 40′ at one place, and several cuts made on a succession of deposits, which have a N.W. strike and a S.W. dip. W. G. Hickson, of Manvel, owner.

Copper World Mine.—It is a prospect, 55 miles N.W. of Vanderbilt. J. H. Boyd, of San Bernardino, owner.

Dry Lake District.—Some rich copper ore was developed in Dry Lake District, 15 miles N.E. of Old Woman's Springs, some years since, but nothing except prospect holes sunk on the vein. The ore is copper glance and carbonate.

Mescal District.—It is 20 miles W. of Vanderbilt. There are large deposits of low-grade ores in this district, and within the past year a large number of claims have been located, but only prospecting work was done. There are also gold and silver prospects in the district.

Monument District.—It is 60 miles below The Needles, near the Colorado River. Large deposits and veins containing copper ores are found in the district, and a large number of claims have been located. They are all in the prospective stage, however.

Ord Mountain District.—See our VIIIth, IXth, Xth, and XIIth Reports, pp. 500, 232, 528, and 69. There are many copper prospects in the district, all of which are low grade. Considerable work has been done on them in past years, but all are at present idle. J. B. Osborne, of Daggett, owner.

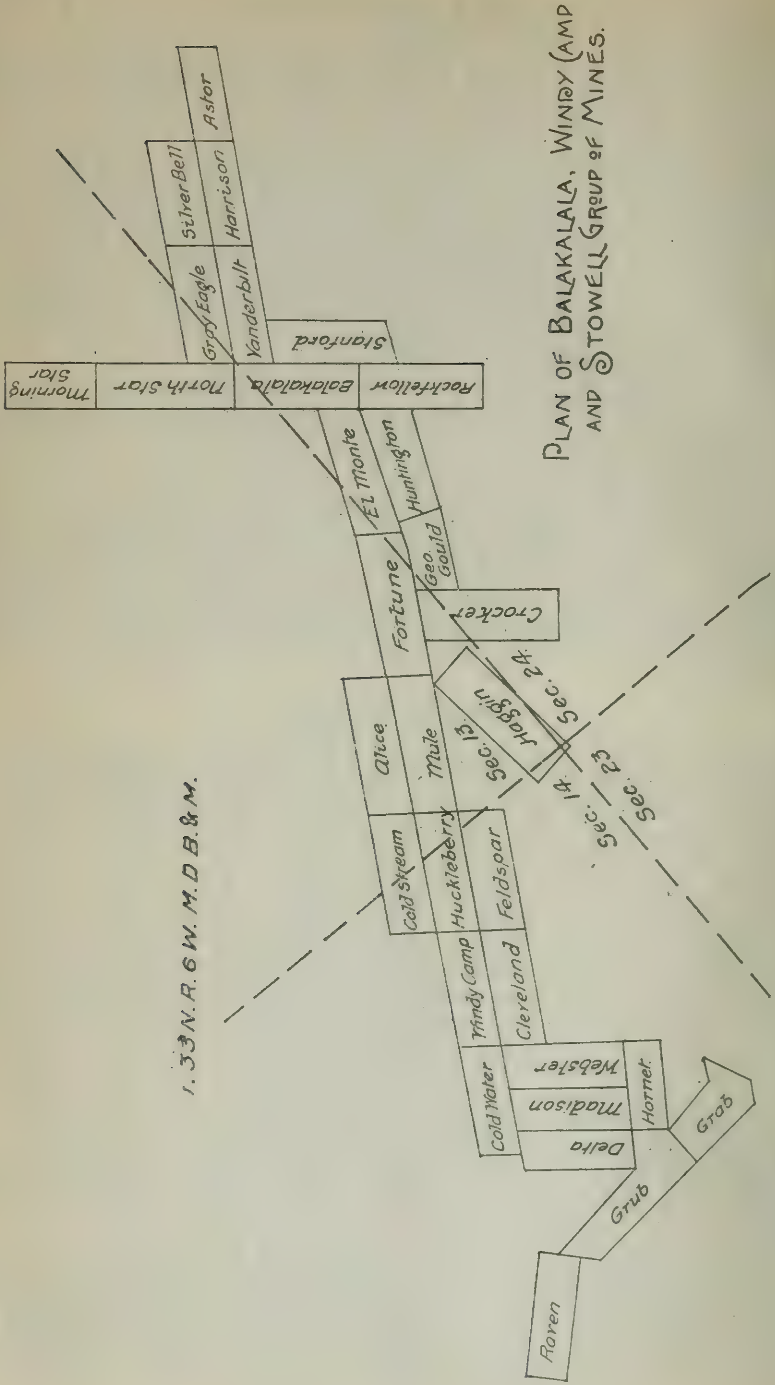
Tiptop Mine.—See our XIth and XIIth Reports, pp. 354 and 69. It is in Lava Beds District, 35 miles E. of Daggett and 10 miles S. of Lavic. The mine is worked through adits. The ore is chalcopyrite and bornite, carrying, it is said, about 15 ozs. silver per ton. Shipments are made occasionally, usually to Swansea, via San Francisco. W. N. Masters et al., of Cleveland, Ohio, owner; Willis Steadman, of Daggett, superintendent.

Shasta County.

Balakalala Mines.—See Balaklava in our XIIth Report, p. 245. They are 7 miles N.W. of Copley, at 2,330′ elevation, and comprise eleven claims, with a general N.W. course, showing a pronounced gossan outcrop, spreading in places to over 100′ in width. The formation extends through many miles of country, including, on its course, the Iron Mountain Mine, Stowell Mine, Windy Camp group, etc. The ore-bodies are remarkable for the large masses of solid sulphides, carrying iron, copper, silver, and some gold. Tunnels have been driven at different levels on the ore-bodies, and a few shallow shafts sunk along the outcrop 24′ and 90′ deep; the tunnels penetrate 800′, 200′, 80′, and 70′. Opportunity for deep tunnel workings are exceptionally favorable from the Squaw Creek side of the mountain. The company own a water-right of 400 inches on North and South Squaw creeks, which may be delivered under 650′ pressure through 2½ miles of flume. Only sample tests of the ore have been worked. Six men are at work. W. M. Murray et al., of Shasta, owners. (See plan on next page.)

Blue Jacket Mine.—See our XIIth Report, p. 69. It is in Sec. 25, T. 34 N., R. 4 W., and 1 mile E. of the United States fishery on McCloud River.

Copper City (*Bully Hill*) *Mine.*—It is 3 miles N. of Copper City, and comprises three claims. The ore-bodies range N.E. and S.W., and carry copper, silver, and gold. It has been reopened during the last year, by cleaning out the old tunnels and driving a new tunnel to cut the vein 275′ below the surface, which is now in over 200′. Ten men are



PLAN OF BALAKALALA, WINDY CAMP AND STOWELL GROUP OF MINES.

employed. H. McDonnel et al., of San Francisco, owners; J. Sallee, of Copper City, superintendent.

Mountain (*Iron Mountain*) *Mines* (*Limited*).—See our XIIth Report, p. 377. These mines are on Iron Mountain, 8 miles N.E. of Shasta, at 3,400′ elevation, and comprise three claims. Since our last report the property has passed into the hands of an English company, which has constructed 10.7 miles of 3′ narrow-gauge railroad from the mine to Keswick, a point 1 mile above the S. P. R. R., where a 100-ton smelter and other necessary buildings have been erected. From the main line to Keswick the road carries three rails to accommodate both standard-gauge and narrow-gauge cars. The maximum grade is 3½%, and to prevent accidents from runaway cars, two derailing switches have been inserted, one above and the other below Keswick. The present rolling-stock consists of 2 locomotives, 10 dump cars, and 2 flat cars. Supplies will be taken direct from the S. P. Co.'s line to both smelter and mine, and the ores loaded on the cars in the mine are delivered at the smelter; 100,000 tons of ore can be stored at the smelter, and the handling of the ores, slag-pots, etc., will be done by hydraulic machinery. Over 150,000 lbs. of steel and iron have been used to date in the construction of the furnace. A 40 Kilowatt dynamo furnishes the power required at present. All information concerning, and admission to the mine, was refused. In November, 1895, the company was employing 1,200 men on the road, smelter, and mine. The process of smelting, as first practiced, was a failure. It is said that after months of experimenting a satisfactory process has been adopted and the smelters are now running smoothly. The Mountain Mines Co. (Limited), of London, owner; Alex. J. Hill, of Keswick, manager.

Kosk Creek Mines.—They are a late discovery, situated in Secs. 23 and 24, T. 37 N., R. 1 W., on Kosk Creek, near the "big bend" of Pitt River, at 2,000′ elevation. The creek cuts through the formation for a distance of 1,800′, along 65′ of which the formation, an igneous rock, carries copper sulphurets with native copper. The course of the mineralized body is N.E. and S.W. There are fourteen claims. A shaft has been sunk 15′, and a tunnel started near the creek-level. Clay and F. Taylor et al., of Redding, owners.

Peck Mine.—See our XIIth Report, p. 70. It is at Furnaceville, and adjoins the Afterthought on North Cow Creek. Idle.

Windy Camp (*Huckleberry*) *Mines.*—They are 7 miles N.W. of Copley, at 2,410′ elevation at lowest workings, 2,550′ at upper workings, and comprise thirteen claims, on the same ore-body as the Iron Mountain and Balakalala mines. They carry the same metals—iron, copper, silver, and gold. Eight different tunnels have been started at different levels on the ore-body, none, however, of any great extent. Four men are employed. W. M. Murray et al., of Shasta, owners; — Weil, of Copley, superintendent.

Sierra County.

Depot Hill Mine.—It is 5 miles N. of Camptonville. There are seams of copper ore not worked.

Siskiyou County.

Richie Mine.—It lies on Boulder Creek, 3½ miles S.W. of Callahan, at 4,720′ elevation. The vein is from 2′ to 6′ wide, and dips 80° N.W. The ore is quartz, carrying copper ores—bornite, chalcopyrite, and malachite. Idle.

Trinity County.

Nonpareil Mine.—It is on the East Fork of New River, 8 miles E. of Francis, at 2,400′ altitude. The developments consist of a 35′ tunnel, and several open cuts. The vein is 4′ wide and dips 26° E. The foot-wall is slate and the hanging-wall porphyry. The ore is sulphurets of copper and iron, with a little gangue. Idle. C. S. McAtes, of Francis, owner.

Tulare County.

Page Mine.—See our XIIth Report, p. 297. It lies in a low ridge of hills, 7 miles N.E. of Visalia. The vein is 4′ thick, and is filled with silicious matter, impregnated with copper pyrite, and carrying a trace of gold. Idle. J. Prothers, of Visalia, owner.

TOTAL PRODUCTION OF GOLD IN CALIFORNIA SINCE 1848, BY YEARS, ACCORDING TO DIFFERENT AUTHORITIES.

[Silver contained in gold has been parted and is not included in the tables.]

A great deal of interest having been manifested and considerable diversity of opinion expressed as to the total amount of gold produced in California, the following table has been collated, from the best known authorities,

By Charles G. Yale, Statistician.

Year.	J. D. Whitney. (a)	J. Ross Browne. (b)	J. Arthur Phillips. (c)	U. S. M'g Report. (d)	W. P. Blake. (e)	R. W. Raymond. (f)	J. J. Valentine. (g)	L. A. Garnett. (h)	U. S. Mint. (i)	Chas. G. Yale. (j)	Year.
1848	$5,000,000		$10,000,000	$10,000,000				$245,301		$245,301	1848
1849	20,000,000	$4,921,250	40,000,000	40,000,000	$66,000,000			10,151,360		10,151,360	1849
1850	45,000,000	27,676,346	50,000,000	50,000,000				41,273,106		41,273,106	1850
1851	65,000,000	42,582,695	55,000,000	55,000,000	45,989,000			75,938,232		75,938,232	1851
1852	62,500,000	46,588,434	60,000,000	60,000,000	45,779,000			81,294,700		81,294,700	1852
1853	62,500,000	57,330,034	65,000,000	65,000,000	54,965,000			67,613,487		67,613,487	1853
1854		51,328,653	60,000,000	60,000,000	52,045,633			69,433,931		69,433,931	1854
1855		45,182,631	55,000,000	55,000,000	45,161,731			55,485,395		55,485,395	1855
1856		48,880,543	55,000,000	55,000,000	50,697,434			57,509,411		57,509,411	1856
1857		48,976,697	55,000,000	55,000,000	48,976,692			43,628,172		43,628,172	1857
1858		47,548,025	50,000,000	50,000,000	47,548,026			46,591,140		46,591,140	1858
1859		47,649,462	50,000,000	50,000,000	47,640,462			45,846,599		45,846,599	1859
1860		42,203,345	45,000,000	45,000,000	42,325,916			44,095,163		44,095,163	1860
1861		40,639,080	40,000,000	40,000,000	40,676,758			41,884,995		41,884,995	1861
1862		42,561,761	34,700,000	34,700,000	42,561,761			38,854,668		38,854,668	1862
1863		46,071,920	30,000,000	30,000,000	46,071,920			23,501,736		23,501,736	1863
1864		55,707,201	26,600,000	26,600,000	56,707,201			24,071,423		24,071,423	1864
1865		44,984,546	28,500,000	28,500,000	45,308,227			17,930,858		17,930,858	1865
1866			26,500,000	25,500,000	44,364,393			17,123,867		17,123,867	1866
1867				25,000,000	41,676,292			18,265,452		18,265,452	1867
1868				22,000,000		$22,000,000		17,555,867		17,555,867	1868
1869				22,500,000		22,500,000		18,229,044		18,229,044	1869
1870				25,000,000		25,000,000	$17,500,000	17,458,133		17,458,133	1870
1871				20,000,000		20,000,000	19,447,354	17,477,885		17,477,885	1871
1872				19,000,000		19,049,098	18,143,314	15,482,194		15,482,194	1872
1873				17,000,000		18,025,722	17,280,951	15,019,210		15,019,210	1873
1874						20,300,531	17,617,124	17,264,836		17,264,836	1874
1875						17,753,151	16,326,211	16,876,009		16,876,009	1875
1876							16,099,559	15,610,723		15,610,723	1876
1877							15,237,729	16,501,268		16,501,268	1877
1878							17,306,508	18,839,141		18,839,141	1878
1879							17,166,166	19,626,654		19,626,654	1879
1880							17,745,745	20,030,761	$15,618,361	20,030,761	1880
1881							17,166,676	19,223,155	18,200,000	19,223,155	1881
1882							15,470,325	17,146,416	16,800,000	17,146,416	1882
1883							13,841,297	17,256,873	14,120,000	24,316,873	1883
1884							12,896,594		13,600,000	13,600,000	1884
1885							12,338,014		12,661,044	12,661,044	1885
1886							13,208,034		14,716,506	14,716,506	1886
1887							11,836,957		13,588,614	13,588,614	1887
1888							10,076,091		12,750,000	12,750,000	1888
Forw'd	$260,000,000	$740,832,623	$836,300,000	$985,800,000	$864,495,446	$164,628,502	$296,704,649	$1,100,337,165	$132,054,525	$1,174,718,383	Forw'd

TOTAL PRODUCTION OF GOLD IN CALIFORNIA SINCE 1848—Continued.

Year.	J. D. Whitney. (a)	J. Ross Browne. (b)	J. Arthur Phillips. (c)	U. S. M'g Report. (d)	W. P. Blake. (e)	R. W. Raymond. (f)	J. J. Valentine. (g)	L. A. Garnett. (h)	U. S. Mint. (i)	Chas. G. Yale. (j)	Year.
Forw'd	$260,000,000	$740,832,623	$836,300,000	$985,800,000	$864,495,446	$164,628,502	$296,704,649	$1,100,337,165	$132,054,525	$1,174,713,333	Forw'd
1889	--------	--------	--------	--------	--------	--------	10,329,044	--------	11,212,913	11,212,913	1889
1890	--------	--------	--------	--------	--------	--------	9,896,851	--------	12,309,793	12,309,793	1890
1891	--------	--------	--------	--------	--------	--------	10,455,488	--------	12,728,869	12,728,869	1891
1892	--------	--------	--------	--------	--------	--------	10,361,486	--------	12,571,900	12,571,900	1892
1893	--------	--------	--------	--------	--------	--------	11,172,036	--------	12,422,811	12,422,811	1893
1894	--------	--------	--------	--------	--------	--------	12,540,646	--------	13,923,281	13,923,281	1894
1895	--------	--------	--------	--------	--------	--------	14,004,108	--------	15,334,317	15,334,317	1895
Totals	$260,000,000	$740,832,623	$836,300,000	$985,800,000	$864,495,446	$164,628,502	$375,464,308	$1,100,337,165	$222,558,409	$1,265,217,217	Totals

(a) From Whitney's Metallic Wealth of the U. S.: Philadelphia, 1854, p. 147.

(b) This table, from U. S. Mining Commissioner J. Ross Browne's Report of 1867, p. 50, shows only the amount of treasure actually manifested for exportation from San Francisco in the respective years. Mr. Browne, however, allows $45,000,000 for money in use on the Pacific Coast and $5,000,000 for nuggets and specimens. There were no manifests at the port in 1848, and Mr. Browne estimates the actual gold product of the years 1848-49-50 as about $100,000,000. He puts down the amount unmanifested in 16 years at about $200,000,000. He estimates the total product of the Coast up to the end of 1865 as $1,000,000,000, all from California except $100,000,000, which was from Nevada, Idaho, Oregon, Arizona, Washington, and British Columbia. This would leave Mr. Browne's estimate of the entire gold yield of California to the end of 1865 as $900,000,000 instead of the apparent total given in the table.

(c) From "Mining and Metallurgy of Gold and Silver," by John Arthur Phillips: London, 1867, p. 66.

(d) This is a frequently quoted table from U. S. Mining Commissioner Raymond's Report of 1873, p. 543, which he states is "compiled from various sources." Up to 1865 it is identical with that of J. Arthur Phillips. In the remaining years the figures do not always agree with those given officially in Mr. Raymond's Annual Reports, though in some years they are the same.

(e) From Blake's Report on the Precious Metals (Paris Exposition, 1867): Washington, 1869, p. 20. Prof. Blake was Commissioner from California to the Exposition. The table shows exports of treasure from San Francisco for the years given. Prof. Blake adds 10 per cent for unmanifested bullion, $45,000,000 for coin in circulation and gold used in the arts, deducts treasure received from British Columbia, Mexico, etc., and estimates the total product of Pacific Coast to 1868 as $961,000,000. Of this total, he estimates the yield of gold in California from 1848 to 1868 as $807,000,000. Another table giving these same figures of export from San Francisco, accompanied by a statement purporting to be based on estimates of W. P. Blake, will be found in the volume on Precious Metals of the 10th Census, p. 380. The estimate column corresponds with the table of J. Arthur Phillips to 1859, and from there to 1863 the annual amounts differ. Prof. Blake tells the compiler of this sheet, however, that "my final table in the work on Precious Metals I have always regarded as the most accurate figures obtainable."

(f) This statement is compiled from the several Annual Reports of U. S. Mining Commissioner Raymond during his term of office.

(g) These figures are from the Annual statements of John J. Valentine, of Wells, Fargo & Co.'s Express, and represent the gold dust and bullion carried by express each year, with a percentage added for that carried by other conveyances. The record was not kept in this way before 1870. These figures have been revised by Mr. Valentine for this statement.

(h) From Bowie's "Practical Treatise on Hydraulic Mining in California": New York, 1885, p. 288. The table was compiled by Louis A. Garnett, for many years manager of the San Francisco refinery, who had abundant opportunity to eliminate some of the inaccuracies which have crept into published statements, and which have been adopted and repeated by subsequent statisticians. This table is made up for fiscal years, so the data might conform to official reports.

(i) From Annual Reports of the Director of the U. S. Mint. The figures given are those from the recapitulation tables at the end of the chapters on California, in the several Reports.

(j) This complete table to date is compiled from estimates of L. A. Garnett and the U. S. Mint Director's Reports, these being considered by the compiler the most correct and complete of any extended continuous statements. Mr. Garnett's figures are for fiscal, and those of the Mint for calendar, years. To account for the omission of the final six months of 1883 in Mr. Garnett's table, half of the total of that year's full figures of the Mint are added to his statement of the year, which will account for the apparently excessive product of 1883 as given. On consultation with Mr. Garnett, it was agreed that this was the only feasible method of reconciling the difference of fiscal and calendar years, in combining the two tables.

NOTE.—A table made up of the separate estimates of Blake in the 10th Census, p. 380, of Raymond in the U. S. Mining Commissioner's Report of 1873, p. 543, and of John J. Valentine, of Wells, Fargo & Co., added together, make a total to January 1, 1896, of $1,266,091,886; while that compiled by Yale from the estimates of Garnett and the U. S. Mint Reports to January 1, 1896, makes a total of $1,265,217,217. There is, therefore, only a difference in the two sets of estimates of $874,669, which is remarkably close, and shows that the aggregate in the last column is reasonably correct, considering the large amount, and the period covered by the table.

GOLD.

Alameda County.

In driving tunnels on the land of the California Improvement Co. (see Macadam), gold is said to have been found in the basalt to the value of several dollars per ton.

Alpine County.

No active mining has been carried on in this county during the period covered by this report.

MILLS IN ALPINE COUNTY.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of Each, in Lbs.	Capacity per 24 Hours, in Tons.
Colorado No. 2	Steam	20	600	40
Exchequer	Steam	18	700	30
Pioneer	Steam	10	800	20

Amador County.

The general revival of interest in mining has noticeably affected this county during the past two years. Several new mines have been opened and numerous properties, after years of idleness, have been rehabilitated and are in a fair way to once more become bullion-producers. Some of the propositions inaugurated prior to our last report have since been placed on a paying basis, and at least one prominent mine then operating with small success has developed into a large and profitable enterprise. The deepest operating mine has a vertical depth of 2,150′, and others will soon be as deep or deeper. One very commendable change has been made in the sinking of new shafts. Until recently all the deep shafts in the great mines have been sunk in the veins, and it has been the general experience that when these fissures were not filled with solid quartz, great expense always attended the maintenance of these shafts, by reason of the heavy swelling ground, which continually displaced and crushed timbers. The most recent practice is to sink large working shafts in either the foot-wall or the hanging-wall, at some distance from the vein; some of these are inclined and are sunk at a uniform angle, approximating that of the vein; others are vertical in the hanging-wall. One enterprise is sinking a vertical three-compartment shaft, which is not expected to reach the vein in less than 1,750′ from the surface. Another large new shaft is now down over 1,000′.

Of all the prominent operations in progress within the past two years, but two have suspended, while in their stead a score of new enterprises have been started. The county has other mineral resources than gold, but these are less important. The construction of a narrow-gauge (24″) railroad from a point midway between Carbondale and Ione to Amador City, has been commenced. Over two miles of the grading has been completed at the valley end of it; work has been suspended for some months, but it is expected to be resumed.

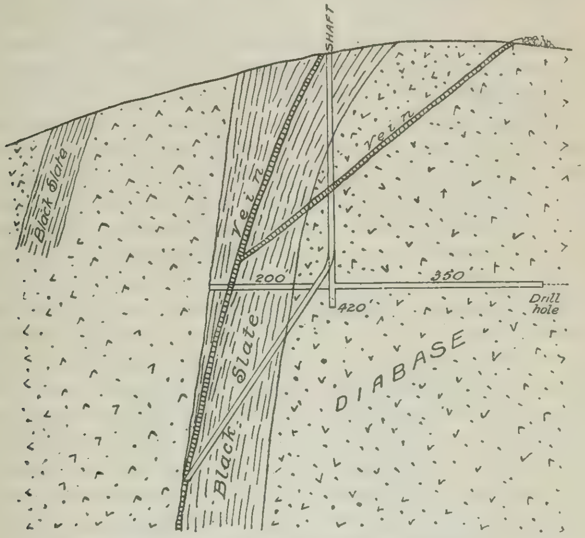
Acme (*Robinson*) *Mine* (Quartz).—It is 3 miles N. of Volcano, near the Oleta stage road. After years of idleness active operations were resumed in the summer of 1895. The shaft is nearly vertical and 300′ deep. It was said the volume of water encountered in the old workings exceeded the capacity of the pumping-machinery. No other cause for shutting down was learned. A 10-stamp mill forms part of the surface plant. Ten men are employed. Acme Mining Co., owner.

Albany Mine (Quartz).—See New Albany Consolidated.

Allison Mine (Quartz).—See Tripp.

Allison Mine (Quartz).—It is situated 1½ miles N.W. of Plymouth. The vein is from 2′ to 4′ wide, and carries marcasite and mispickel with gold. The developments consist of two shafts 30′ and 70′, respectively; the former is a double-compartment 5′x 9′ in the clear, and is substantially timbered and provided with a good hoisting-plant. A 3′ Huntington mill has been used to crush the quartz, but did not give satisfactory results, owing to the extreme hardness of the quartz. The vein occurs in brecciated diabase. Albert Allison, of Plymouth, owner.

Alma Mine (Quartz).—See our XIIth Report, p. 70. It is situated ¼ mile W. of Jackson, at 1,265′ elevation. In 1893 a three-compartment vertical shaft was commenced and sunk 420′. At 400′ a cross-cut was run west in the foot-wall for the purpose of intersecting a vein, the croppings of which appear upon the surface 350′ W. of the shaft. In July, 1895, the cross-cut had reached a point 300′ W. of the shaft, but no *large* vein had been encountered in shaft or cross-cut, either in the form of quartz or fissure. A diamond drill was then employed to prospect 100′ or more beyond the face of the cross-cut. The geology of the Alma is very interesting, and the history of its development exemplifies in a marked manner the necessity of careful investigation of geological conditions before determining upon a plan of development. The hill upon which the Alma is located consists chiefly of granular diabase, through which runs a zone of black slate about 200′ in width. The shaft was started nearly in the center of the black slate strip, continuing in it to a depth of 270′, where it enters the west diabase and continues in it to the bottom of the vertical portion. Quartz croppings appear 350′ W. of the shaft, and were mistaken for a lode 100′ wide, whereas they are those of a vein a few inches in thickness lying in broken fragments on the surface of the ground, the hanging-wall diabase having been almost entirely denuded to within 350′ of the shaft where the vein dips 35° E. into the diabase. A small vein, 3″ or 4″ in thickness, inclosed in diabase, crosses the shaft about 300′ from the surface, which is probably the downward continuation of the vein exposed on the croppings. In an open cut, a short distance south of the shaft, a gouge seam 12″ thick is exposed in the black slate. The same fissure may be observed in the bed of Jackson Creek. The strike of this fissure carries it a few feet east of the collar of the Alma shaft, which fact was not noticed at the time the shaft was commenced. Failing to find a vein in the west country, a cross-cut was run into the hanging-wall from the 400′ station; it passed a few feet through diabase and then entered the black slate, which is about 140′ wide on this level. The vein, containing low-grade quartz, was passed through in the slate belt, the cross-cut being continued to the hanging-wall diabase. It was then determined to sink an inclined shaft, at an angle of 61° 30′, starting from the 350′ level of the vertical shaft. A curve was cut having a radius of 52′, and the shaft continued to 375′ on the incline, which point was reached about August 1, 1896. The shaft encountered the hanging-wall diabase at that depth, and sinking on the contact is in progress. In some respects the geology of the Alma is quite similar to that of the Kennedy. Twenty men are employed. Alma Gold Mining Co., of San Francisco, owner; John B. Francis, of Jackson, superintendent.



CROSS SECTION - ALMA MINE, JACKSON.

Alpine Mine (Quartz).—It is situated in the town of Plymouth, and north of the old Empire. It has been idle for many years until the spring of 1895, when some work was done under bond, and about 40 tons of rock mined and milled. The shaft is 700′ deep, but caved. Bank of California, San Francisco, owner.

Amador Consolidated (*Eureka and Badger*) *Mine* (Quartz).—See our Xth Report, pp. 72 and 102. It is situated in the southern suburbs of the town of Sutter Creek. Idle for years. Hetty Green, of New York, owner.

Amador Gold Mine (Quartz).—See Jackson Gold Fields (Limited).

Amador Queen Mine No. 1 (Quartz).—See Jackson Gold Fields (Limited).

Amador Reduction Works (Chlorination).—See our VIIIth Report, p. 96. They are on an eminence N. of the town of Sutter Creek. The plant consists of one reverberatory furnace and a series of leaching and precipitation vats of the ordinary type. The works have a capacity of 135 tons monthly, and are run on custom ores. Five men are employed. Barney & Voorheis, of Sutter Creek, owners; Hon. E. C. Voorheis, superintendent.

American Flat Mine (Drift).—It is ½ mile S.W. of Oleta. A small force of men were at work in the summer of 1895. George Beard, of Oleta, superintendent.

Anita Mine (Quartz).—It is ½ mile S.W. of Jackson. In early times Mexicans took a large amount of gold from surface workings. Some years ago an inclined shaft was sunk 65′, and at 45′ from the surface a drift and cross-cut were run. In these workings the vein is found striking N. 20° W; a branch makes into the foot-wall in a sweeping curve to the N.W. and W. A reorganized company commenced a new shaft 50′ N. and W. of the old workings, and in July, 1895, it had reached a depth of 190′, from which point a level was run E. 125′, where a 20″ vein was cut. The branch found in the drift north from the old incline was also encountered in the new cross-cut. The main vein dips 43° E., and is entirely in diabase, which, near the vein, is altered to chloritic and talcose schist. The new shaft has an inclination of 63°, and was started in black slate, in which it continued to a depth in 125′, when it encountered the diabase. A belt of the black Mariposa slates lies some distance east of this mine, being separated from the slates at the shaft by a belt of diabase. At contact of slate and diabase in the shaft, a fissure containing irregular bunches of quartz and calcite with iron and copper sulphurets was found. The quartz has the appearance of having been subjected to some secondary leaching process, presenting a peculiar cellular structure, due perhaps to the removal of a portion of the calcite. After reaching the vein in the cross-cut as above described, it was determined to sink another inclined shaft east of the second shaft, on the foot-wall, at an angle of 63°. In August, 1896, it was 480′ deep. No cross-cutting has as yet been done. Fifteen men are employed. Anita Gold Mining Co., owner; P. Reichling, of Jackson, superintendent.

Argonaut Mine (Quartz).—See our XIIth Report, p. 71. It is 1 mile N.W. of Jackson, joining the Kennedy on the south. The inclined (63°) shaft, which was commenced in 1893, had reached a depth of 1,350′ early in August, 1896. The vein crossed the shaft about 300′ from the surface, dipping 40° E. At 1,050′ quartz was again found in the hanging-wall side of the shaft. The bottom of the shaft is in slate, with an 8′ crevice, containing foliated slate and some quartz. The mine is equipped with a very substantial hoisting-plant, run by means of hemp rope transmission from a water-wheel placed in a pit 30′ below. The winding reels are placed 250′ from and about 60′ below the collar of the shaft, so that they are 297′ distant from the sheaves on the gallows frame, which rests on bedrock and is securely fastened by anchor bolts; the sill timbers are also weighted with tons of railroad iron and massive blocks of stone. Twenty men are employed. Argonaut Mining Co., of San Francisco, owner; W. F. Detert, of Jackson, superintendent.

Arroyo Seco (*Lambing*) *Mine* (Placer).—Fully described in our VIth Report, p. 23, and VIIIth Report, pp. 97–104. It is 3 miles N. of Ione. A small quantity of water was being used through a 6″ pipe and 2½″ nozzle under a pressure of 90′. The bank of gravel is about 8′ in depth, and is quite hard. The sluice grade is very light, and dump poor. Four men are employed. Frank Frates, of Ione, superintendent.

Astoria Mine (Quartz).—It is 4 miles S. of Jackson. See New Albany Consolidated.

Badger Mine (Quartz).—See Amador Consolidated.

Bay State Mine (Quartz).—It is 4 miles N. of Plymouth. See our XIth and XIIth Reports, pp. 146 and 71. In July, 1895, the shaft had reached a depth of 640′. Three shoots of ore had been partially developed. The average progress in sinking the double-compartment shaft, 4½′x 9′ in the clear, in the hard, black slate of the foot-wall, has been 50′ per month with hand drilling. A well-constructed 10-stamp mill has been built, and is run continuously. Nineteen men are employed. Bay State Mining and Development Co., owners; W. T. Jones, of Plymouth, superintendent.

Belding Mine (Quartz).—See Contention.

Bellwether Mine (Quartz).—See our Xth and XIth Reports, pp. 104 and 140. It is ½ mile N.E. of Jackson, at 1,400′ elevation. In years past a large amount of development has been done, including five shafts ranging from a few feet to 180′ in depth and several hundred feet of tunnels. A new 5′x 14′ three-compartment incline (62°) is now being sunk, and had reached a depth of 100′ in August, 1896. Fourteen men are employed. Bellwether Mining Co., of Chicago, owner; D. H. Duncanson, of Jackson, superintendent.

Belmont (*Sutter Creek*) *Mine* (Quartz).—See our VIIIth and XIth Reports, pp. 73 and 143. It is ½ mile N. of the town of Sutter Creek. Dismantled and idle.

Bernardis Mine (Quartz).—It is ½ mile E. of Sutter Creek, and has been opened since the publication of our XIIth Report. It is on what is locally termed the East Lode. The workings are in amphibolite schist (altered diabase), through which is a reticulated mass of veins of various widths, and bunches of quartz. Several pay-shoots are exposed, and are separated by altered diabase. A 3-stamp mill crushes 10 tons of rock daily. The gold is coarse, and is mostly amalgamated inside the battery. Five men are employed. George Allen, of Sutter Creek, owner; James Bernardis, lessee.

Black Hill (Quartz).—See Loyal.

Bunker Hill Mine (Quartz).—See South Mayflower.

Burner Reduction Works (Cyanide).—They were built for the express purpose of treating the large accumulation of tailings from the Amador Reduction Works, after several experiments had been made in the vats of the same. Some of these tests, it is said by the manager, were entirely satisfactory, but others not so. On this insufficient test a cyanide plant, consisting of twenty-four leaching-tanks, and all the accessory arrangements, was built at a cost of about $8,000. After a series of careful operations, carried on over a period of several months, the works were closed; presumably not a success. E. M. Burner & Co., of Sutter Creek, owners.

Central Eureka (*Summit*) *Mine* (Quartz).—See our Xth, XIth, and XIIth Reports, pp. 104, 144, and 79. It is ¼ mile S. of Sutter Creek. After having laid idle for many years, the mine was bonded, a company organized, and work commenced in the fall of 1895. The old developments consist of three shafts, 75′, 500′, and 700′ deep, respectively, the last being the south shaft. A water-power hoist was placed on this shaft early in 1896, and it was said to be the intention to sink 200′ deeper, and then drift south, to connect with the 900′ level of the South Eureka Mine. This company also owns an east vein about 100′ E. of the Central Eureka, which will be known as the East Central Eureka, but it will be worked in connection with the Central Eureka. A water-power air-compressor, 12″x 30″, has been installed to furnish power for the pumps. Twelve men are employed. John Tregloan, of Alameda, owner; Central Eureka Mining Co., holders of bond; W. R. Thomas, of Sutter Creek, superintendent.

Colorado Mine (Quartz).—It is a prospect 2½ miles E. of Volcano. W. Q. Mason, of Volcano, owner.

Contention (*Belding*) *Mine* (Quartz).—It is 2½ miles N.W. of West Point, Calaveras County, and is an old mine being reopened. Thomas Severns, of West Point, owner.

Clinton Consolidated Mine (Quartz).—See Union Consolidated.

Clough Mine (Quartz).—See Reward.

Crown Point Mine (Quartz).—See our XIIth Report, p. 92. It is 2 miles N.W. of West Point, Calaveras County. Formerly a large producer, but idle for several years past. Crown Point Mining Co., of Oakland, owner.

Dane & Mitchell Mine (Quartz).—It is 1 mile S.E. of Pine Grove. In litigation, and idle.

Downs Mine (Quartz).—See our VIth Report, p. 20. It is 2 miles E. of Volcano. Idle and dismantled. R. C. Downs, of Sutter Creek, owner.

Doyle Mine (Quartz).—See our Xth Report, p. 107. It is 2 miles S. of Jackson. William Doyle, of Jackson, owner.

Dry Creek Mine (Placer).—It is 5 miles N. of Volcano, and is worked by ground-sluicing. Five men are employed. Reale, Bell & Hadley, of Jackson, owners; George Hadley, of Volcano, superintendent.

Easton Mine (Quartz).—It is 2½ miles N.E. of Plymouth, and is a new prospect. On July 1, 1895, the inclined shaft had been sunk 60′ on the vein, which was 1′ wide at the surface, but had widened to 6′ of solid quartz at the bottom; it carries about 2% of sulphurets. Both walls are well defined, and the inclosing country rock is altered diabase. George Easton, of Plymouth, owner.

Elephantine Mine (Quartz).—It is 3½ miles S. of Jackson. See New Albany Consolidated.

Empire Mine (Quartz).—See Plymouth Consolidated.

Eureka Mine (Quartz).—See Amador Consolidated.

Evans (*Meek*) *Mine* (Quartz).—It is a patented claim, ¼ mile S. of Jackson, adjoining the Zeila. It has only superficial development. Mrs. Ellis Evans, of Jackson, owner.

Farrall Mine (Quartz).—It is on the Mokelumne River, 4 miles S. of Jackson, and has a 5-stamp mill. Idle in July, 1895. Nathan Rosenburg et al., of Jackson, owners.

Fifty-four Flat Mine (Placer).—It is 5 miles N.W. of Volcano. Idle. Fifty-four Flat Mining Co., owner; Dr. Nichols, of Sutter Creek, president.

Focus Mine (Quartz).—It is on Sutter Creek, 2 miles W. of Volcano, and is a new enterprise. A 10-stamp mill was erected in July, 1895. Ten men are employed. H. M. Wolfe, of Volcano, superintendent.

Forty-nine Flat Mine (Drift).—It is 4 miles N. of Volcano. It is opened by a tunnel 600′ in length, and has numerous lateral drifts.

The gravel is lightly cemented, and does not wash freely in sluices. The owners contemplate putting in machinery to disintegrate the gravel. Six men are employed. A. L. Reale et al., of Jackson, owners.

Fremont Mine (Quartz).—It is 1½ miles N. of Amador City, and forms part of the Gover property.

Gold Mountain (*Quartz Mountain*) *Mine* (Quartz).—See our Xth, XIth, and XIIth Reports, pp. 75, 145, and 72. After a brief period of activity in 1893, it was again idle in 1895. Gold Mountain Mining Co., of 325 Montgomery Street, San Francisco, owner.

Good Hope Mine (Quartz).—It is in Jackson, and has recently been reopened. The shaft, an 80° incline, was 125′ deep in August, 1896. Hoisting is done with a horse-whim. About half an inch of water is raised with a small jackhead pump. The shaft is sunk on the ore channel, which contains a foot or more of gold-bearing quartz, and 4′ or 5′ of foliated slate, including quartz seams. Eight men are employed. Good Hope Mining Co., of Jackson, owner; Charles Peters, of Jackson, superintendent.

Gover Mine (Quartz).—See our VIIIth, Xth, XIth, and XIIth Reports, pp. 53, 75, 146, and 72. It is 2 miles N. of Amador City. Operations were suspended during a part of 1894–95, but were resumed in the latter part of 1895, under the direction of Col. Isaac Trumbo. It is said that a new 60-stamp water-power mill will soon be built. Forty-two men are employed. C. E. Purrington, of Amador City, superintendent.

Gracey Mill.—It is situated at Pioneer, 5 miles E. of Volcano, and consists of a roller mill similar to the Chile mill. It is run on custom rock. Charles Gracey, of Pioneer, owner.

Hardenburg Mine (Quartz).—See our Xth, XIth, and XIIth Reports, pp. 68–106, 139, and 74. It is 3½ miles S. of Jackson. After considerable exploration in 1893–94, and the discovery of gold-bearing rock on the 1,000′ level, operations were suspended in the winter of 1893–94, the prospect evidently being deemed too small to warrant further exploration. Hayward & Lane, of San Francisco, lessees.

Harding Mine (Quartz).—See Madrona.

Hazard Mine (Quartz).—See Treasure.

Hollywood Mine (Quartz).—It is 3½ miles S. of Jackson. See New Albany Consolidated.

Irma Mine (Quartz).—It is at Pioneer, 5 miles E. of Volcano. The vein occurs in grano-diorite, the quartz containing 10% sulphurets, chiefly pyrrhotite. The shaft is 193′ deep. Idle and dismantled. L. Cassinelli, of Volcano, owner.

Ivanhoe Mine (Quartz).—It is 2½ miles N.E. of Plymouth. The mine has two shafts, 100′ and 120′, respectively. The influx of water into the deeper shaft was so great that heavier pumping machinery became a necessity. The owners not wishing to make this outlay, have since worked the upper portion of the mine, which consists of decayed amphibolite schist and quartz, containing gold. The mine has a 5-stamp mill, which is usually run during the daytime and occasionally at night. Seven men are employed. S. C. Wheeler, of Plymouth, owner.

Jackson Gate (*Massa*) *Mine* (Quartz).—It is 1 mile N.W. of Jackson. The croppings are very prominent and massive. Some time ago a tunnel was run 100′ or more to cut the vein. In the fall of 1895 an inclined shaft was commenced, which, in August, 1896, had reached a depth of 400′, and considerable cross-cutting and drifting had been done. The characteristic feature of this mine and the Bellwether, which joins it on the south, is the broad zone of ankerite and mariposite which forms the bold outcrop. In this respect these mines bear a marked resemblance to those in Tuolumne County, near Quartz Mountain and Golden Rule Hill. Fourteen men are employed. Jackson Gate Mining Co., of San Francisco, owner; John B. Francis, of Jackson, superintendent.

Jackson Gold Fields Co. (Limited).—This property comprises the *Amador Gold* and *Amador Queen* mines, 1¼ and 2 miles S. of Jackson, respectively. See our VIIIth, Xth, and XIIth Reports, pp. 88, 102, and 71. A new incline was commenced on the Amador Queen in July, 1895, which had reached a depth of 300′ in August, 1896. The manager stated that it was the intention to crush the rock from this mine in the mill built for the Amador Gold Mine. Six men are employed. Jackson Gold Fields Co. (Limited), of London, owner; James E. Dye, of Jackson, general manager.

Kate Gray Mine (Quartz).—A prospect 2½ miles E. of Volcano. W. Q. Mason, of Volcano, owner.

Kelly Mine (Quartz).—It is at Pioneer, 5 miles E. of Volcano. It has a shaft 90′ deep. Frank Kelly, of Volcano, owner.

Kelly Mine (Quartz).—See our Xth Report, p. 108. Idle. Henry Emerson, of Jackson, owner.

Kennedy Mine (Quartz).—See our VIIIth, XIth, and XIIth Reports, pp. 66, 70, 103, 141, and 74. It is 1 mile from Jackson. Since our previous report, the south shaft has been sunk 200′, making it 1,950′ vertically below the collar of the shaft, and nearly 2,500′ on the incline below the croppings. The north shaft has been sunk 400′, giving a vertical depth of 2,150′, with a 50′ sump. The mine is operated steadily. The Gates canvas plant, operating on tailings from the Kennedy mill, has been reconstructed since 1894. It embraces no new essential features, however. One hundred and five men are employed. Kennedy Mining and Milling Co., of San Francisco, owner; J. F. Parks, of Jackson, superintendent.

Keystone Mine (Quartz).—See our VIth (Part II), VIIIth, XIth, and XIIth Reports, pp. 16, 63, 145, and 77. It is in Amador City. Concerning this mine there is nothing new that is noteworthy. The shaft is the same depth as recorded in our last report, viz., 1,400′. During the night of January 2, 1895, the 40-stamp mill, which had been in constant operation for fifteen years, was destroyed by fire. It was replaced by a back-knee frame battery of 40 stamps and every modern convenience, including ten Woodbury concentrators and one 5′ Huntington mill, etc. All troughs, lights, etc., are suspended on iron rods, and the view in front of the battery is unobstructed. The mill was in full operation the forty-ninth day after the fire; a remarkably short time in which to make plans, secure machinery, and construct so large a mill. Ninety men are employed. Keystone Mining Co., of San Francisco, owner; E. T. Hale, of Amador City, superintendent.

Lambing Mine (Placer).—See Arroyo Seco.

Little Amador Mine (Quartz).—It is in the town of Amador City. Since our last report some prospecting work has been done, and a Griffin mill erected. It is now idle, but the reason for suspension was not stated. East Mayflower Gold Co., owner; S. H. Emmens, of Amador City, superintendent.

Littlefield Mine (Quartz).—It is 4 miles S. of Jackson. See New Albany Consolidated.

Lincoln, North Lincoln, and South Lincoln Mines (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 73, 72–100, and 78. They are ½ mile N. of Sutter Creek. Idle for years. T. J. Clavering et al., of San Francisco, owners.

Loyal (*Loyal Lead, Black Hill*) *Mine* (Quartz).—See our VIIIth Report, p. 51. It is 1 mile E. of Drytown, and adjoins the Gover on the east. Idle. A. L. Wayne et al., of San Francisco, owners.

Lucille (*New London*) *Mine* (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 49, 117, and 78. It is in the southern suburbs of Plymouth. An inclined shaft was sunk on the vein years ago to the depth of 1,300′. After a long period of idleness, English capital became interested. In the fall of 1894 a new hoist and a fine 40-stamp mill were erected, and the caved shaft reopened and retimbered to a depth of about 400′. Operations were suddenly suspended for some financial reason. Lucille Mining Co., of England, owner; A. Harpending, of Nashville, El Dorado County, manager.

Madrona (*Harding*) *Mine* (Quartz).—It is about 3 miles S.E. from Volcano and ½ mile S. from Pioneer, and is one of the mines in the West Point granite belt. The developments are on a fissure of varying width, and though only a prospect, the owners had 400 tons of quartz on the dump in the summer of 1895, which was to be sent to a custom mill at Pioneer. Four men are employed. Griesbach & Mason, of Volcano, owners.

Mahoney and South Mahoney Mines (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 73, 72, and 78. They are ½ mile N. of the town of Sutter Creek, and were purchased in 1894 by the Wildman Company, after having been idle some years. The Mahoney shaft is 1,000′ deep, and a drift run south has made connection with the Wildman workings at the 600′ level of the latter mine. The Mahoney Mine has been entirely rehabilitated, retimbered, refitted, and rearranged. The 40 stamps, with 16 Frue vanners, have been running for some months past. The stamps weigh 850 lbs., and are dropped 7″, 96 times per minute. A 20-mesh (No. 6) screen is used; the height of discharge is 6″, which is kept as nearly uniform as possible by the use of chuck-blocks, which are removed from beneath the screen as the dies wear down. The capacity per stamp is 3¾ tons in twenty-four hours. The front of the mortar is closed in the usual manner by a wooden frame secured by driving iron wedges at the sides. The screens are tacked to a separate, smaller frame, which is secured to the front side of the large frame, resting in flat iron chairs or hooks at the bottom, and wedged at the top. This is found to be a convenient way of getting at the inside plates without removing the heavy frame, and also prevents sand and fragments of broken quartz from falling out on the plates, should it be necessary to open the battery temporarily. The inside front copper plate is fastened to the base of the large frame. The outside (apron) plates are 4′ wide for a distance of 6′, where they taper to 3′. In this distance there are four drops of 2″ each, dividing the apron into four plates, each 18″x 4′. At the lower end of the apron-plate is a mercury trap, 10″ deep, extending the full width of the plates. It is 2″

wide, the lower edge being 2″ lower than the upper. In this slot, 3′x 2′, is placed a dividing-board ¾″ thick and 36″ long, which reaches to within 1″ of the bottom of the slot. The pulp from the apron-plate drops into the slot, passes underneath the division and, rising on the lower side, flows over the edge of the trap on to the sluice-plate, which also is provided with 2″ drops and has a mercury trap similar to that described. The sluice-plates are divided into two sections, each 18″ wide. A second sluice-plate, without drops, is placed below the first, being also double. At its lower end these plates are merged into a single one contracted to 12″ in width, having a trap at its lower end, from which the pulp passes to the vanners. It may be called one of California's model mills. Sixty-four men are employed. Wildman Gold Mining Co., owner; John Ross, Jr., of Sutter Creek, superintendent.

Mammoth Mine (Quartz).—It is a prospect, 1½ miles N. of Plymouth. Idle, and ownership in dispute.

Mammoth Mine (Quartz).—See our VIth (Part II), VIIIth, XIth, and XIIth Reports, pp. 21, 93, 67–108, and 78. Idle. W. A. Nevills, of Jamestown, Tuolumne County, owner.

Markley Mine (Quartz).—It is 5 miles N. of Volcano, and in early days was a bullion-producer. See U. S. Mineral Statistics West of Rocky Mountains: 1870–71–72, pp. 37, 89, and 44. Work will shortly be resumed.

Massa Mine (Quartz).—See Jackson Gate.

Mayflower Mine (Quartz).—See our XIth report, p. 78. It is ½ mile N. of Amador City. In operation in 1893; now idle. It is said that a new shaft and other improvements are in contemplation. The Amador Gold Mine (a corporation), owner; S. H. Emmens, of Amador City, superintendent.

McIntyre Mine (Quartz).—See our Xth Report, p. 115. It is ½ mile S.W. of Amador City. After a long period of idleness, it was reopened in the summer of 1895. John McIntyre et al., of Sutter Creek, owners.

Mechanics Mine (Quartz).—It is ½ mile E. of Sutter Creek. After several years of idleness, active operations were recommenced in the summer of 1895; a test run on 60 tons of quartz having yielded a satisfactory return in bullion. P. Fagan, of Sutter Creek, owner.

Medean Mine (Quartz).—It is ½ mile S. of Amador City, joining the South Spring Hill Mine on the east. A new incline had reached a depth of 300′ in July, 1895, and the quartz mined was being crushed in the South Spring Hill mill. Thirty-five men are employed. South Spring Hill Gold Mining Co., owner; John R. Tregloan, of Amador City, superintendent.

Middle Bar Mine (Quartz).—It is 4 miles S. of Jackson, near Middle Bar crossing of the Mokelumne River, and has a steam hoist. Idle. See New Albany Consolidated.

Modoc Mine (Quartz).—It is ¾ mile E. of Pioneer, midway between Volcano, Amador County, and West Point, Calaveras County. A cross-cut tunnel was being driven in August, 1895, to prospect the vein. F. Mace, of Volcano, owner.

Moore Mine (Quartz).—See our VIth (Part II),VIIIth, and XIIth Reports, pp. 20, 84, and 78. It is 1 mile S. of Jackson. Idle. W. A. Nevills, owner.

New Albany Consolidated Mines (Quartz).—See our XIIth Report, p. 78. They are on the Mother Lode, south of Jackson, and comprise the *Albany*, *Astoria*, *Elephantine*, *Hollywood*, *Littlefield*, *Middle Bar*, and *New Albany*. All idle. New Albany Consolidated Gold Mining and Milling Co., owner; Martin Jones, of San Francisco, agent.

New London Mine (Quartz).—See Lucille.

New York Mine (Quartz).—See our Xth, XIth, and XIIth Reports, pp. 123, 140, and 78. It is 3 miles W. of Jackson. G. W. Anderson, of Jackson, owner.

North Gover Mine (Quartz).—It is 1 mile E. of Drytown, and adjoins the Gover. Reuben Ford et al., of Amador City, owners.

North Star Mine (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 71, 99, and 78. Idle. Hon. E. C. Voorheis, of Sutter Creek, owner.

Oneida Mine (Quartz).—See our VIIth, Xth, and XIIth Reports, pp. 79, 109, and 78. It is 2 miles N. of Jackson. After an idleness of many years the work of reopening this mine was commenced early in January, 1896. A vertical three-compartment shaft is being sunk in the hanging-wall country rock, which, in August, 1896, was 340′ in depth. The plans for new gallows-frame and powerful hoisting machinery have been made, and the permanent plant is soon to be installed. Power drills were used for a time in this shaft, but they have been discontinued. Twenty-six men are employed. Ross E. Browne, of San Francisco, manager.

Pacific Mine (Quartz).—See Plymouth Consolidated.

Philadelphia (*Richmond*) *Mine* (Quartz).—See our XIIth Report, p. 78. It is 4 miles N. of Plymouth, and has been partly developed by an open cut 250′ long, 120′ high at the face, and from 20′ to 80′ wide. Near the center of this exposure is a large quartz vein of varying width. Other, though smaller, veins occur erratically in the slates on either side of the central vein. A double-compartment incline shaft is being sunk, and in August, 1896, was 115′ deep. A 15-stamp mill was erected in 1894. Operated under lease by the International Gold Syndicate (Limited), of London; J. J. Crawford, of Placerville, owner.

Phœnix Reduction Works (Chlorination).—See our VIIIth Report, p. 96. Located at Drytown. The plant consists of one reverberatory furnace and a series of leaching and precipitating vats. The capacity of the works is 90 tons per month. They are run on custom concentrates. Five men are employed. Voorheis & Barney, of Sutter Creek, owners; E. S. Barney, superintendent.

Pioneer Mine (Quartz).—See our XIIth Report, p. 78. It is in the southern suburbs of Plymouth. The work of development is now actively in progress. Eight men are employed. Pioneer Mining Co., owner; R. Robinson, of Plymouth, superintendent.

Plymouth Con. (*Empire and Pacific*) *Mines* (Quartz).—See our VIth, VIIIth, Xth, and XIth Reports, pp. 15, 42, 117, and 79. It is in Plymouth. Idle and dismantled. A. Hayward et al., owners.

Posey Hill Mine (Placer).—It is 5 miles N.E. of Volcano, and is worked in a small way. Two men are employed. George Hadley, of Volcano, owner.

Quartz Mountain Mine (Quartz).—See Gold Mountain.

Rancheria Mine (Placer).—It is 5 miles N.W. of Volcano, and is worked by ground-sluicing. Four men are employed. George Evans et al., of Volcano, owners.

Red Cloud Mine (Quartz).—It is 2½ miles N.E. of Plymouth, adjoining the Easton Mine on the north. An incline had reached a depth of 80′ early in July, 1895. Ten feet of quartz is exposed in an open cut on the surface. The hoist is run by steam power. Eight men are employed. Red Cloud Mining Co., of Stockton, owner; W. J. Hussey, of Plymouth, superintendent.

Reward (Clough) Mine (Quartz).—It is on the Clough ranch, ¾ mile E. of Pine Grove. A vein has been opened by tunnels; a 5-stamp mill was in operation in July, 1895. Eight men are employed. Reward Gold Mining Co., owner; W. C. Smith, of Pine Grove, superintendent.

Robinson Mine (Quartz).—See Acme.

Robinson Mine (Quartz).—It is 6 miles S.E. of Oleta. It has a shaft 250′ deep, with an 8-stamp mill, which crushes 12 to 16 tons of quartz daily. Nine men are employed. Robinson & Co., of Oleta, owners.

Seaton Mine (Quartz).—It is 1 mile E. of Drytown. It is reported that it will soon be started up. Idle. A. Hayward, of San Francisco, owner.

South Eureka Mine (Quartz).—See our Xth, XIth, and XIIth Reports, pp. 113, 144, and 79. It is ½ mile S. of Sutter Creek. The incline shaft had reached a depth of 1,200′ in July, 1896. A level was opened at 500′ from the surface at the time the shaft was sunk, and some ore of low grade found. A second level was established at 900′, and an ore-shoot of great promise discovered. The shaft is sunk in black slate on a fissure filled with a crushed, foliated mass of slate and veinlets of quartz and calcite. The ground is very heavy, and necessitates the employment of men constantly in retimbering, reinforcing the timbers, and relieving the ground, and is another evidence that it is not economy to sink deep shafts on the Mother Lode in the soft fissures. The expense of sinking in the walls is probably 30% to 50% greater, but the cost of keeping a well-timbered shaft open which is sunk in solid rock is comparatively small. The greater portion of the claim is covered with andesite bowlders and cobbles, the capping of an ancient river channel, and there was nothing on the surface to indicate the whereabouts of a vein. A survey was made north from the Kennedy Mine, taking the 1,650′ level as a basis for operations. The line was extended through the South Eureka ground on the surface; a second line was surveyed south from the Eureka Mine. These two lines were found to be approximately parallel and 100′ apart on the surface of the South Eureka claim. A point was chosen midway between the lines and the shaft commenced, with the result above mentioned. On driving a cross-cut east on the 600′ level, a water channel or reservoir was encountered, and so heavy was the pressure that the drill was thrown several feet by the force of the stream. The flow was stopped by constructing a substantial bulkhead in the drift. The upper portion of the mine is extremely wet, and water-tight, cemented bulkheads were built in a number of places. This plan, together with that of catching up water at stations on the upper levels, prevents the great volume of water from reaching the bottom of the mine. On the 900′ level a cross-cut was run east to the contact of black slate and diabase, and at this contact the vein of gold-bearing rock was discovered. Along the hanging-wall side of the vein the chloritic and talcose schists (altered diabase) is found to contain auriferous iron pyrites and free gold to the extent of making the schists a portion of the pay zone. The drift has been run in the foot-wall most of the way, frequent cross-cuts having been made into the vein, exposing a fine shoot of ore ranging from a few inches to 5′. Along the foot-wall side of the vein is a rich pay streak from 1″ to 10″ in width, heavily sulphuretted and high grade. A 20-stamp mill was built in the summer of 1895, and a steam boiler has been placed in the hoist, to be used should the water-supply fail. The South Eureka Mine is an example of what may be accomplished by judicious investment of capital on the great gold belt that runs through this portion of the State. There are other places as promising, if not more so, than was this prior to its development. Fifty-seven men are employed. South Eureka Gold Mining and Milling Co., owner; J. F. Parks, of Jackson, superintendent.

South Mahoney Mine (Quartz).—See Mahoney.

South Mayflower (*Bunker Hill*) *Mine* (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 57, 75–114, and 79. It is in the northern suburbs of Amador City. Worked in 1895 by "tributers" in the south end of the mine. With this exception no work was in progress. Idle in 1896. East Mayflower Gold Co., owner; S. H. Emmens, of Amador City, superintendent.

South Spring Hill Mine (Quartz).—See our VIIIth, Xth, XIth, and XIIth Reports, pp. 80, 73–98, 145, and 79. In litigation and stopped by injunction. South Spring Hill Gold Mining Co., of Lemonston, Mass., owner; John R. Tregloan, of Amador City, superintendent.

St. George Mine (Quartz).—It is 1½ miles N. of Plymouth. Idle. Thomas George et al., of Plymouth, owners.

St. Junian Mine (Quartz).—It is a prospect, 4 miles S. of Jackson. Idle. St. Junian Gold Mining and Milling Co., owner; Hon. A. Caminetti, of Jackson, manager.

Stewart Mine (Quartz).—It is a short distance below Big Bar Ridge, 4 miles S.E. of Jackson. Provided with a 3-stamp mill. Idle, and in litigation.

Strong Mine (Quartz).—It is a prospect, 1½ miles N. of Amador City. East Mayflower Gold Co., owner.

Summit Mine (Quartz).—See Central Eureka.

Sutter Creek Mine (Quartz).—See Belmont.

Telegraph Hill Mine (Drift).—It is near Rancheria Creek, 5 miles N.W. of Volcano. A tunnel has been driven on the channel 700′. Four men are employed. George Evans and M. Fitzgerald, of Volcano, owners.

Tellurium Mine (Quartz).—See our XIIth Report, p. 79. It is 1 mile N. of Pine Grove. Idle. N. G. Young, of Volcano, agent.

Tierakoff Mine (Quartz).—See our XIIth Report, p. 92. Idle. Crown Point Mining Co., of Oakland, owner.

Treadwell Mine (Quartz).—It is 7 miles E. of Sutter Creek, and is an old prospect, being worked in 1895. There is a 6-stamp mill on the property. Nine men are employed. William Castle, of Volcano, superintendent.

Treasure (*Hazard*) *Mine* (Quartz).—It is 1½ miles N. of Amador City. Years ago a long tunnel was driven in on the vein from a point near the base of the hill, near Rancheria Creek, and an incline sunk a short distance on the hillside above the tunnel. After years of idleness a hoisting-plant was put in place, and sinking commenced in the summer of 1895. The shaft, sunk at contact of slate foot-wall and diabase hanging-wall, was 400′ deep in August, 1896, and at a point 375′ from the surface a drift is being driven south. Nine men are employed.

A. Hayward, of San Francisco, owner; Wales Palmer, of Amador City, superintendent.

Tripp Mine (Quartz).—It is ¼ mile above Big Bar Ridge, 5 miles S.E. of Jackson. It was extensively opened in former years by a series of tunnels. The property includes the *Allison Mine*, which joins it. Both are now idle. A 10-stamp mill, built for the Tripp Mine, is running on quartz from the Garner Mine, on the opposite side of the Mokelumne River, in Calaveras County, and is included in the property. See Garner Consolidated, Calaveras County. Tripp & Lucas, owners; S. H. Lucas, of Jackson, superintendent.

Union (*Clinton*) *Consolidated Mine* (Quartz).—See our XIth and XIIth Reports, pp. 142 and 72. After a period of idleness, operations were resumed in the spring of 1896, and considerable prospecting work is now being done. D. Gutman et al., of San Francisco, owners.

Valparaiso Mine (Quartz).—It is a prospect, 4½ miles S. of Jackson. Joseph Poggi et al., of Jackson, owners.

Wheeler Mine (Drift).—It is 2½ miles S. of Pine Grove. It was worked under bond in 1894, but was idle in 1895. J. T. Wheeler, of Pine Grove, owner.

Wildman Mine (Quartz).—See our VIIIth, Xth, XIth, and XIIth Reports, pp. 75, 101, 144, and 80. It is in the town of Sutter Creek, and is worked in connection with the *Mahoney*. The shaft is 1,300′ deep, on an inclination of 70°, and has two compartments, there being a small section partitioned off for pump and ladder-way. The shaft has been sunk in the fissure, and the ground is usually very heavy, often swelling and shifting, and causing a great amount of expense and trouble in keeping the timbers in place and the shaft in line. A large portion of the shaft timbers has been reinforced repeatedly. Connection has been established on the 600′ level with the 800′ or corresponding level of the Mahoney. Since the advent of the new management several ore-bodies have been opened on the 500′, 600′, 1,200′, and 1,300′ levels, and sufficient pay-rock is now in sight to keep the 30-stamp mill in operation many months. The pay-shoots occur in chloritic and talcose schists (altered diabase) lying between walls of black slate. These schists are silicified and impregnated with auriferous iron sulphurets and free gold. Masses and veins of quartz also occur throughout the mineralized zone, the quartz also being gold-bearing. In the lower levels of the mine no lenses or masses of quartz are found at the contact of slate and diabase, which may be considered distinctively contact veins, as in the South Eureka or Kennedy mines. In places the diabase, chloritic schist, etc., have been proven, by cross-cuts, to be 100′ wide, and from borings made by diamond drills it appears to become wider southward. The following figures, showing approximately the cost at which a large quartz mine may be operated in California under favorable conditions, are furnished by Mr. John Ross, Jr.:

Cost of Mining One Ton of Ore at the Wildman Mine during the Year ending October 1, 1895.

Timbers	$0 16.0
Spiling	04.8
Lumber	02.2
Charcoal	01.7
Candles	02.1
Powder	04.8
Fuse	01.1
Caps	00.2
Water for power	09.9
Freight	02.9

Iron	$0 01.1
Steel	00.7
Hardware	02.4
Oil	00.8
Grease and tar	00.2
Coal	00.2
Miscellaneous	03.4
Surveying	01.3
Power drill machinery	03.2
Wire rope	00.7
Half of insurance and taxes	01.1
Half of office and assay supplies	00.5
Pump repairs	00.7
Superintendence and labor	1 40.1
Total	$2 02.1

The above includes all repairs, equipment, diamond-drill development, and general development work of the mine, cost of operating rock-breaker, and delivering ore in the bin of the mill.

Cost of Milling One Ton of Ore in 30-Stamp Water-Power Mill (capacity 100 tons per day) for a Period of One Year.

Shoes	$0 01.9
Dies	01.5
Screens	00.4
Quicksilver	00.6
Wood	00.3
Hardware	00.4
Belting	01.1
Water for power	09.4
Freight Lumber Oil Grease and tar	00.2
Cyanide	00.3
Miscellaneous	00.6
Half assay supplies	00.2
Half office supplies	00.2
Expressage on bullion	00.5
Hauling sulphurets	01.6
Half insurance and taxes	01.1
Superintendence and labor	16.1
Total	$0 36.4

This includes all repairs and equipment. Total cost of mining and milling one ton of quartz, $2 38.5. Sixty-two men are employed. Wildman Gold Mining Co., owner; John Ross, Jr., of Sutter Creek, superintendent.

Wolverine Mine (Quartz).—It is situated at Sutter Creek, between the Eureka and Wildman. It has no machinery, and has been idle for years.

Zeila Mine (Quartz).—See our VIIIth, Xth, XIth, and XIIth Reports, pp. 68–85, 68–104, 139, and 80. It is in the town of Jackson. The shaft is 1,160′ deep, the lowest level being at 940′. Since our last report the mill plant has been supplied with new mortars, mortar-blocks, and battery-frame. The old mortars were in constant use for fifteen years, their period of usefulness having been greatly prolonged by the use of inside linings. The furnace of the chlorination works has also been rebuilt, and some necessary changes made about the hoisting works. The company has recently purchased 25 acres lying immediately east, and the sinking of a new vertical shaft in this area is under consideration. One hundred and ten men are employed. Zeila Mining Co., owner; W. F. Detert, of Jackson, superintendent.

Zumwalt Mine (Quartz).—It is ½ mile east of Pioneer. Idle, and in litigation. L. D. Wicks, of Volcano, owner.

MILLS IN AMADOR COUNTY.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of Each, in lbs.	Capacity per 24 hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
					No.	Character.	No.	Capacity.		
Acme		10	950	20	5	Hendy				
Amador		60	850		24	Frue				
Amador Queen	Water	20	950	60						
Bay State		10	850	20	4	Frue				
Bernardis		3	900	9						
Clinton Consolidated		10	850							
Farrall		5	850	12						
Focus		10	850							
Gover		20	850	50	8	Frue				
Ivanhoe	Water	5	950	12						No data.
Kennedy		40	850	100	24	Frue				
Keystone Consolidated *		40	950	90	10	Woodbury				2,500 sq. ft.
Live Oak	Water	2	850	5–6						
Loyal Lead	Water	10	700	15						
Lucille		40	850							
Mahoney and South Mahoney		40	850	140	4	Frue				
Mayflower		40	850		14	Frue				
Nevills	Water	10	750	25						
Philadelphia	Water	10								
Pioneer		20	850							
Reward		5	850	12	2					
Robinson		8	700	12–16						
South Eureka		20	850							
South Spring Hill		40	750	100	10	Frue				
					2	Triumph				
					2	Woodbury				
Stewart		3								
Sutter Creek	Water	10	850	15–20						
Treadwell		6	800	10						
Tripp		10	850	25						
Tripp and Allison		10	850							
Wildman		30	850	95	8	Frue				
					4	Triumph				
Zeila		40	800	140	16	Frue				

In addition to stamps, the mills marked with a * have additional crushing capacity, as noted in the following list:

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN AMADOR COUNTY.

Name of Mill or Mine.	Power.	Number	Character.	Diameter	Capacity per 24 hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
						No.	Character.	No.	Capacity.		
Allison		1	Huntington	3′							
Gracey		1	Roller quartz		12–16						
Keystone Consolidated		1	Huntington								
Little Amador		1	Griffin		16	2	Frue				

CUSTOM WORKS IN AMADOR COUNTY.

Amador Reduction Works								1	4½		
Burner Reduction Works			(At Sutter Creek.)							50 tons.	
Phœnix Reduction Works								1	3		

Butte County.

Alki Mine (Drift).—See Parry.

Aurora Mine (Drift).—See Princess.

Bader Mine (Drift).—See our XIIth Report, p. 80. It is 1½ miles E. of Magalia, at 2,350′ elevation, and contains 110 acres. The course of the channel is N. 30° E. Since our last report the main tunnel has been driven to 1,400′ in length, the channel crossed, and some breasting done. The bedrock tunnel is being extended 130′ to reach the bottom of the channel through an upraise. This channel cuts through a quartz ledge striking N.W. and dipping N.E. in slate and porphyry, from 2½′ to 14′ wide. Four men are employed. G. B. Mowry, of Magalia, owner.

Bangor Mine (Drift).—See our XIth and XIIth Reports, pp. 164 and 80. It is 1 mile E. of Bangor, and comprises 2,400′ on the channel. F. W. Johnson, of Marysville, owner.

Banner Mine (Quartz).—It is 5 miles N.E. from Oroville, at 550′ elevation, and comprises 6,000′ by 200′ of patented ground. There are three veins, bearing N.W. with a nearly vertical dip, designated the *Amoskeag*, *Big Banner*, and *Little Banner;* the two latter unite at a depth of 200′; the first, 700′ N., remains undeveloped. The foot-wall is slate, the hanging-wall diabase. The main shaft is in the hanging-wall, 107′ from the vein in the lowest works. It is a double-compartment vertical shaft, 800′ deep, and is being continued to 1,000′ depth; there are stations at every 100′ down to the 600′ level, connecting with the vein; below the 600′ level is a winze down to the 700′ level, but no drifting has been done on the vein below the 600′ level. The ore-supply comes from the workings near the surface, and from the ore-shoot north of the shaft, which is 200′ long. The principal stopes are between the 400′ and 600′ levels. The greatest extent of drifting is 700′ north on the 300′ level, and 800′ north on the 500′ level. The mine makes from 3 to 4 miner's inches of water, which is raised by two electric pumps, one at the 300′ and the other at the 600′ level. A cross-cut to the Amoskeag vein on the 300′ level is 700′ long, and made use of as a reservoir. The pumps have a capacity of 138 gals. per minute. The power for the entire plant is electric, with steam as auxiliary. The main dynamo in the power-house is run by two 5′ Pelton wheels under 48 lbs. pressure per square inch, and is 3 miles distant. The two air-compressors, mill, rock-breaker, two pumps, and saw-mill are each run by a separate motor. There are also 60 electric lights of 24 candle-power in and around the works. There are two compressors, a Rand and a Burleigh, for 3 and 8 drills, respectively. The mill, which is not being run while sinking the shaft, has 10 stamps of 850 lbs. weight, with frame for 10 additional; 14′ of aprons set on a 1¼″ grade per foot; two Hendy, two Triumph, and one Johnston concentrator. The capacity of the mill is 2 tons to the stamp per day, using a No. 35 brass wire screen, with 6″ drop and 92 drops per minute, with 7½″ discharge. The mortars are supplied with front and back plates. Adjacent to the mill is a large laboratory, melting and assay office. Sawed timbers are used in the mine, brought from Magalia Ridge, 25 miles distant, at a cost of $14 per M; the lagging is brought from Forbestown Ridge. Golden Banner Gold Mining Co. (Limited), owner; George E. Evans, of Oroville, superintendent.

Bessie Mine (Quartz).—See Wild Yankee.

Best Mine (Drift).—See Napa and Solano Counties Mining Co.

Bishop & Wells Mine (Quartz).—It is 3½ miles W. of Merrimac, and comprises two claims. The 3′ vein strikes N. and S., and dips 45° W., between porphyry and granite walls. There is a tunnel 100′ long on the vein, giving 40′ of backs. A 5-stamp mill with 300-lb. stamps is driven by an 8′ hurdy wheel under 40′ pressure, taking water from Clear Creek through ½ mile of ditch. The mill crushes 3 tons per 12 hours. Idle. W. C. Bishop et al., of Merrimac, owners.

Bluebird Mine (Quartz).—It is 2½ miles N. of Inskip, at 3,850′ elevation. The vein strikes N.E. and dips N.W., and is from 3″ to 4″ wide, in a decomposed porphyritic rock. There is a 30′ shaft and several open cuts on the vein. The gold is obtained by washing the quartz in a pan. One man is at work. A. D. Lazelira, of Inskip, owner.

Burgstrasser (*Kickapoo*) *Mine* (Drift).—See our XIIth Report, p. 85. It is 6 miles W. from Strawberry Valley, Yuba County, at 3,500′ elevation, and comprises 100 acres. It was formerly worked as a hydraulic claim, the channel being from 200′ to 300′ across. There is a 300′ bedrock tunnel, with a 12′ upraise into the gravel, and a 300′ gangway. The gravel is removed 6′ high, but no breasting is being done, only prospecting. Three men are employed. Drake, Gronwaldt & Boyce, of Strawberry Valley, Yuba County, owners.

Butte Creek Mine (Quartz).—See our XIIth Report, p. 81. It is on Big Butte Creek, 1 mile E. of Nimshew. T. O. Carter, of Nimshew, owner.

Butte King and Queen Mine (Drift).—See our Xth and XIIth Reports, pp. 145 and 81. It is in Sec. 20, T. 25 N., R. 5 E., and comprises 2,150′ on the channel, by 100′ wide. Butte King and Butte Queen Consolidated Mining Co., owner; J. W. Woods, of Chaparral, superintendent.

Buzzard Mine (Quartz).—See Edna M.

Cain's Mine (Quartz).—It is ⅞ mile S. of Inskip, at 4,250′ elevation. The vein runs E. and W., and dips N., in a slate formation. A tunnel is being driven on the vein. Two men are employed. — Cain, of Inskip, owner.

Carlisle Mine (Quartz).—It is on the South Fork of Feather River, 2½ miles S.E. from Forbestown. It comprises 640 acres, at 1,275′ elevation. The 9′ vein courses N.E., and dips about 50° N.W. There is an undeveloped parallel vein about 100′ to the N.E. The principal vein shows an ore-shoot pitching N.E., under the bed of the river, and carrying a heavy percentage of high-grade iron, copper, and lead sulphurets, with ribbon quartz. Near the north bank of the river a short cross-cut of 60′ intersects the vein, where a 70′ shaft has been sunk on it. About 30′ feet above, and a short distance N.E., is a second tunnel. The formation is syenitic, with slate and porphyry in close proximity on the east side. On Indian Ravine, near the N.E. end of the property, is another large vein, which has been opened with a short tunnel, yielding a good grade of quartz; while on the S.W. end of the property the *Big Betsy* vein crops out very prominently. A cross-cut, now 75′ long, is being driven on this part of the property to develop the vein. Water-power is available under high pressure on either side of the river. James Carlisle, of Forbestown, owner.

Catskill Mine (Drift).—See our XIIth Report, p. 82. It is in T. 25 N., R. 5 E., 1 mile N.W. from Bangor, at 750′ elevation, and comprises 800 acres. The channel has an E. and W. course, with 12′ of gravel on the bedrock, capped with 3′ of sand, above which is a 6′ layer of gravel.

The gravel is said to be worth $2 50 per cubic yard, and carries 33% of cobbles and bowlders, that are stored in the mine. The 4′ x 10′ double-compartment shaft is vertical and 210′ deep. The main gangway extends 900′ E. and 300′ W.; the breasts are carried from 8′ to 18′ high, 40′ wide, and are timbered with posts and caps; 300′ of the channel has been worked; 60 carloads, of ¾ ton each, are mined per day with 16 breasters. The pump, hoist, and arrastras are run by an 85 H.P. engine; the former is a 6″ jackhead; the two arrastras are 10′ wide, taking 4 tons to a charge, and 8 charges in twenty-four hours. The arrastras discharge through 400′ of sluices into the Rocky Honcut Creek. Ten inches of water is taken from the Forbestown ditch, at a cost of 10 cents per inch. Twenty-three men are employed. C. S. Barefoot, of Bangor, owner and superintendent.

Cherokee Mine (Hydraulic).—See Spring Valley Gold Mining Co.

Church Mine (Drift).—See Princess.

City Garden Mine (Drift).—It is in Oroville, at 175′ elevation, and comprises 10 acres on a former river channel running under the eastern part of the town, with a N. and S. course. A 6′ x 7′ shaft in the clear is 65′ deep; at 25′ gravel was struck, followed by 10′ of cement, then by 5′ of sand, then by cement, then by 5′ of sand, and then by cement to the bottom; it will require 45′ more to reach the bedrock gravel. Idle. G. Becker et al., of Davenport, Iowa, owners.

Clarke Bros. Mine (Quartz).—It is in the Concow District, 10 miles E. of Yankee Hill, at 2,300′ elevation; and adjoins the Pinkston Mine. A tunnel has been run 135′ on the vein, giving 65′ of backs. There is a 12′ steam-power arrastra, crushing 2 tons per twelve hours. Four men are employed. Clarke Bros., of Yankee Hill, owners.

Contention Mine (Drift).—It is ¾ mile S.W. from Lovelock, at 2,800′ elevation, and comprises 60 acres in Sec. 36, T. 23 N., R. 3 E. The work is on an old lava-capped channel, about 30′ wide, running E. and W. A main tunnel runs 190′ in bedrock, then 65′ across the channel, 30′ of which is in gravel 4′ deep, and thence 15′ down stream. About 50′ back from the cross tunnel an 18′ incline has been sunk. No water on the bedrock. The gravel is quartz and slate carrying coarse gold. Wash water is taken from Little Butte Creek, at the mouth of main tunnel. Idle. J. N. Smith, of Lovelock, owner.

Crystal Hill Mine (Quartz).—It is 3 miles N.W. of Enterprise, at 1,100′ elevation. The vein, about 18″ wide, courses E. and W., and dips vertically in granite. There is a tunnel 100′ long and an upraise to the surface. A 4-stamp water-power mill, with 750-lb. stamps, crushes 6 tons daily. Four men are employed. F. Bachman, of Enterprise, owner.

Crystal Peak Mine (Quartz).—It is 3 miles N. of Enterprise, at 1,100′ elevation, and comprises three claims. The 5′ vein courses E. and W., and dips 50° S. in granite. A tunnel has been run 150′ on the vein. There is a 2-stamp water-power mill, with 750-lb. stamps, crushing 3 tons in twenty-four hours. The quartz carries 0.5% of sulphurets, mostly iron. Three men are employed. A. T. Slater and Charles Alm, of Enterprise, owners.

Defiance Mine (Quartz).—See our XIIth Report, p. 82. It is 9 miles N. of Oroville, near Oregon City. A. Eckman, of Oroville, owner.

Dog Hill Mine (Drift).—See our XIIth Report, p. 82. It is 1½ miles W. of Chaparral, at 5,800′ elevation, and comprises 80 acres of ground.

The channel has a N.E. and S.W. course. A new tunnel is being driven 100′ lower than the two principal tunnels, and will have to be extended 600′ in slate bedrock to cut through the rimrock. The channel has 150′ of capping over it, and is about 200′ across. Two men are at work. — Hedges, of Inskip, owner.

Edna M. (*Buzzard*) *Mine* (Quartz).—See our XIIth Report, p. 82. It is 2½ miles W. from Inskip, at 3,850′ elevation. The vein or seam varies from 6″ to 1′ in width. The present workings are in a 400′ tunnel following the seam, which has produced a large amount of gold. There is an 8′ water-power arrastra, run with water taken from the Cherokee ditch. Two men are employed. F. G. Salisbury and E. Henderson, of Inskip, owners.

Excelsior (*Mammoth*) *Mine* (Quartz).—It is 4 miles N.W. from Inskip, at 3,925′ elevation. The vein strikes N. with a vertical dip, and a width of 3″ in slate. There is a shaft on the vein 40′ deep; when sunk to 100′ it will connect with a tunnel now about 240′ in length, and requiring to be extended 80′ more. A 4-stamp double-stem battery, with square shoes and dies, weighing 350 lbs., to be run by water-power, has been erected for prospecting purposes. The cam works between the two stems. Five men are employed. H. Riley, of Inskip, owner.

Fitzpatrick Mine (Quartz).—It is ¾ mile from Inskip, at 4,250′ elevation. The 4′ vein strikes N. and S., and dips 60° E. in a granite formation. A tunnel has been driven 495′ on the vein, giving 110′ of backs. Only assessment work is being done. J. Hodnalt, of Inskip, owner.

Forty-nine Mine (Quartz).—See New Oregon.

Gold Bank Mine (Quartz).—See our Xth, XIth, and XIIth Reports, pp. 125, 162, and 83. It is ¼ mile N.E. from Forbestown, at 2,820′ elevation at the hoisting works, and 2,025′ at the lowest tunnel. Since our last Report a deep lower tunnel, 8′x 8′, has been driven to intersect the vein 500′ vertically below the mine works. This tunnel, driven with two machine drills abreast, at a cost of $10 per foot, crossed, 1,200′ from the mouth, a mineralized quartzite formation, which was taken for the vein and drifted on a couple of hundred feet, and an upraise made; later, the main tunnel was continued a distance of 400′, where for the first time water and small veinlets of quartz were encountered. The rock formation, with the exception of the quartzite dike, shows no appreciable change throughout the entire length of the work. As the upper workings show a gradual straightening of the vein, amounting to at least 7°, the vein proper may not be reached in the tuunel for some distance. The 40-stamp water-power mill is kept steadily running, showing an output of 4,300 tons per month, using a No. 7 slot-punched screen. A 4-drill Rand compressor has been erected below the big tunnel. Water power, 160 miner's inches, under 350′ pressure, is obtained from the Forbestown ditch. Over 1,200′ of 11″ air-pipe is used with a No. 4 Sturtevant exhaust fan. One hundred and five men are employed. H. P. Stow, of Forbestown, owner and superintendent.

Golden Butterfly Syndicate's (*Limited*) *Mine* (Drift).—It is in Morris Ravine, 4 miles N. of Oroville, at 300′ elevation. It is 3½ miles long and of varying width, and contains 1,220 acres. The channel has a N. and S. course, and a tunnel has been driven 700′ on a N.E. course and 120′ below the channel on an incline, from which an upraise has been started. Seventeen men are employed. Golden Butterfly Syndicate (Limited), owner; S. P. Moody, of Oroville, superintendent.

Golden Feather Channel Co.'s (*Limited*) *Mine* (Placer).—See our XIth and XII Reports, pp. 150 and 83. It is situated just above Oroville, at 190′ elevation. During the past season of six months 400′ of the river channel has been worked and 500′ stripped. The power for the "elevator" is derived from the Miocene ditch, through ¾ mile of 36″ to 16″ pipe into the claim. Two derricks with 53′ booms are used. A dynamo, run by a 3′ Pelton wheel, furnishes 20 arc lights. Five elevators of an improved pattern were placed in position this spring, started up about August 1st, and are doing good work. Fifty men are employed. An English incorporated company, owner; George E. Evans, superintendent.

Golden Fissure Mining Co.'s Mine (Quartz).—It is 3½ miles W. of Enterprise, at 1,500′ elevation. The 4′ vein courses E. and W., and dips nearly vertically in granite. There is a 100′ tunnel on the vein. Two men are at work. G. H. Snow, of Forbestown, owner.

Golden Summit Mine (Quartz).—See our XIIth Report, p. 84. It is in Sec. 21, T. 25 N., R. 5 E., 18 miles E. of Powellton, on the county line, at 6,600′ elevation, and contains 320 acres of patented ground. The vein, of 8′ average width, strikes N. 66° 30′ E., and dips nearly vertical between syenite and greenstone walls, which are exceedingly hard. A 250′ inclined shaft is tapped at 100′ depth by a drain tunnel 400′ long, and has levels at every 100′; extending 400′ E. and W. on the first level, and 300′ E. and 250′ W. on the second level. A covered track connects the mine and mill, which has 10 stamps of 800 lbs. weight, furnished with forged steel shoes and dies, and two Woodbury concentrators. The motive power is steam, and during the summer 20 men are employed chopping and hauling wood. In February last the boarding-house and supplies were burned, which retarded development some months on account of the deep snows. Thirty-six miners are employed. Goodall, Perkins & Co., of San Francisco, owners; C. G. Kane, of Powellton, superintendent.

Golden Summit Blue Gravel Mine (Drift).—It is 7 miles E. of Inskip, at 6,300′ elevation, and comprises 159 acres. The channel has a S.W. course. The main tunnel, which has just reached gravel, is 900′ in length, with a 19′ upraise in the end. The gravel carries quartz bowlders, and contains coarse gold. Four men are employed. Gregory & Co., of Inskip, owners.

Golden Thread Mine (Quartz).—See our XIIth Report, p. 84. It is 2½ miles N.W. from Inskip, at 3,550′ elevation. The small quartz veinlets have a N.E. trend, are in a decomposed rock and clay formation, and are worked by cuts and tunnels. Two men are employed. Wm. Powers & Son, of Inskip, owners.

Gregory Mine (Quartz).—See our XIIth Report, p. 84. It is 9 miles E. of Chaparral, and on the same channel as the Butte King and Queen. J. B. Doyle, of Chaparral, owner.

Grove Mine (Drift).—It is ¾ mile from Bangor, and adjoins the Catskill on the same channel, at 800′ elevation. An incline, 125′ deep, reaches bedrock on a high point of ground, and a new one is being sunk in a low swale, which will greatly shorten the depth. Two men are at work. An incorporated company of Gridley, owner; Ed. Bloom and partner, of Bangor, lessees.

Index (*Wylie*) *Mine* (Drift).—See our Xth Report, p. 138. It is on Middle Butte Creek, 3½ miles S.E. of Nimshew, at 1,250′ elevation. An old claim on an ancient lava-capped channel, whose general direction is N.E., is being reopened. The water is being pumped out of an old 300′ incline, which shows 3′ to 4′ of gravel. About 50′ lower a tunnel has been started in the bedrock to bottom the channel, and is 100′ in length at present. Three men are at work. N. A. Harris, of Lovelocks, owner.

Inskip Mine (Quartz).—See our XIIth Report, p. 84. It is in Sec. 29, T. 25 N., R. 4 E., ½ mile S.W. of Inskip. Thomas McVeigh, of Inskip, owner.

John Dix Mine (Drift).—See our XIIth Report, p. 85. It is on the west branch of Butte Creek, 6 miles N.W. of Lovelocks, at 2,000′ elevation, and comprises 200 acres on the Portuguese Point channel. It is opened by a 2,800′ incline, and the gravel is breasted out 300′ wide and from 4′ to 5′ high; all of the gravel has to be blasted. When running full-handed, 40 carloads of gravel per shift is the output. Posts and caps are used in breasting, and full sets in the incline. About 2,800′ of the channel has been worked. The hoist is run by water-power, the water coming from west branch of Butte Creek through 2 miles of ditch of 400 miner's inches capacity; lower down the creek a second ditch, known as the Freeze-Out ditch, of 700 miner's inches capacity and a grade of ½″ to the rod, is taken out. There are 200′ of 18″ flume with slate riffles. The gold is coarse. Five men are employed. — McCormick, of Berdan, manager.

Jones Bros.' (Reese) Mine (Drift).—See our XIIth Report, p. 85. It is in Sec. 29, T. 25 N., R. 5 E., 10 miles S.E. of Chaparral, and is the south extension of the Butte King and Queen Mine. Jones Bros. et al., of Chaparral, owners.

Kickapoo Mine (Drift).—See Burgstrasser.

Kline & Malone Mine (Placer and Quartz).—It is on Big Butte Creek, 2 miles W. of Lovelocks, at 1,750′ elevation, and comprises 20 acres. The surface ground is being ground-sluiced to uncover the outcrop of a vein striking N.W. and dipping N.E. There is a foot-wall and a decomposed hanging-wall, presumably originally serpentine, which, it is claimed, carries gold. Water is obtained from an old tunnel above, and gathered in a reservoir 300′ above the point being worked. Three men are employed. B. G. Kline and M. Malone, of Nimshew, owners.

Last Chance Mine (Placer).—It is on Big Butte Creek, 3 miles W. of Lovelocks, at 850′ elevation. The creek is flumed for a distance of 280′; it is 16′ wide at the upper and 9′ at the lower end, 2′ deep, with 3″ to 16′ grade. The season lasts from July to November. There is a 12″x 14″ sub-flume 280′ long, set on a 3″ to 16′ grade. At the lower end is a 10′ current-wheel, which runs a derrick with 40′ mast and 30′ boom. A second flume current-wheel drives a Chinese pump. Five men are employed. Norris, Waldow & Co., of Lovelocks, owners; J. N. Smiths, of Lovelocks, superintendent.

Lost Treasure Mine (Quartz).—See our XIIth Report, p. 86. It is in Sec. 28, T. 26 N., R. 4 E., and Dutch Creek, ¾ mile N.E. of Inskip. J. Hedges et al., of Inskip, owners.

Lucky Bob Mine (Quartz).—See our XIIth Report, p. 86. It is on Feather River, 4 miles N. of Oroville. Col. Frank McLaughlin, of Santa Cruz, Santa Cruz County, owner.

Magalia Drift Mining Co.'s (Perschbaker, Lucretia) Mine (Drift).—See our VIIIth and XIIth Reports, pp. 119 and 87. It is 3 miles N.E. of

Magalia, near Butte Creek, at 2,800′ elevation, and comprises ½ mile on the supposed course of the channel. A 5′x 10′ double-compartment perpendicular shaft has been sunk 502′ to bedrock through lava conglomerate, wash, and compact lava. It is timbered with 8″x 8″ plates, and tightly lagged. On account of seepage from the flooded former works, sinking progressed slowly. The system of pumps includes a compound differential plunger, with a capacity of 500 gals. per minute, with a head of 250′ under 95 lbs. air pressure for sinking purposes; a compound duplex Dow pump at the 245′ station, with a capacity of 500 gals. per minute; a Worthington 8½″ plunger at the 320′ station, with 10″ stroke and 100 gals. capacity; besides relays of a Dow sinking and two Hooker pumps. The entire amount of water being raised amounts to 480 gals. per minute. These pumps are operated with compressed air, adding sufficient steam for reheating purposes. The plant is furnished with two 60 H.P. boilers. The compressor is driven by a Pelton wheel, and the hoist by a 6′ Pelton. The 900 miner's inches of water for power is brought from the Cherokee ditch through 2 miles of ditch and 1,850′ of 30″ and 1,850′ of 26″ pipe. Seventy-five men are employed. An incorporated company, owner; N. D. Rideout, of Marysville, president, and J. T. Markill, of Magalia, superintendent.

Mammoth Mine (Quartz).—See Excelsior.

Mascot Mine (Quartz).—See our XIIth Report, p. 86. It is 6 miles from Oroville. Mine and 10-stamp mill idle. Mascot Mining Co., of Yolo County, owner.

Matheson (*Meredith*) *Mine* (Quartz).—It is 4½ miles N. of Nimshew, at 2,000′ elevation. The 10″ vein courses N.W., and dips 30° E., between a serpentine hanging-wall and a slate foot-wall, carrying a talc casing next the hanging-wall. An open cut, now 400′ long, is being washed along the outcrop, with 150 inches of water from the Cherokee ditch, and through 300′ of 11″ pipe, under 130′ pressure; in winter free water is used. The sluices are 200′ long, 20″ wide, and set on a grade 12″ to 16′. The quartz, which carries coarse gold and sulphurets, is crushed in an 8-stamp mill, with 850-lb. stamps, run by a 45 H.P. engine, which will shortly be replaced by water-power. Four men are employed. D. A. Matheson, of Nimshew, owner and superintendent.

Mattie Mine (Quartz).—It is near the Miners ranch, 8 miles E. of Oroville, at 1,100′ elevation. There are two veins on the property; an E. and W. and a N. and S. vein, the latter very large, but barren. The E. and W. vein dips 40° S., between greenstone and slate, and varies from 8″ to 30″ in width. There are two shafts, 1,400′ apart, 50′ and 10′ deep; on the former, a drift is being carried east. The quartz carries a large percentage of sulphurets, said to be of high grade. Two men are at work. R. M. Green and F. Elliott, of Oroville, owners.

Mesilla Valley Blue Gravel Mining Co.'s (*Welch*) *Mine* (Drift).—It is 1 mile N. of Pentz, and contains 240 acres, at 1,020′ elevation. It is an ancient lava-capped, blue gravel channel, carrying about 25′ of gravel, 6′ next the bedrock being excavated. This gravel carries 60% of bowlders and cobbles that are all stored in the mine. The gold is fine in size and quality. It was formerly worked as a hydraulic. A tunnel has been driven 200′ from the face, and gangways 6′ high and 400′ long are carried up the channel on the slate bedrock. No breasting is being done at present, the gangways being pushed ahead. Water for washing is obtained from the Miocene ditch, and the tail flume is 300′ long, 16″

wide, and set on a 10″ grade. Four men are employed on two shifts. E. C. Wilson, of Pentz, owner.

Mosquito Creek Mine (Quartz).—It is ½ mile E. of Coutolenc, at 2,750′ elevation. The vein strikes N. and S. and dips 60° E. in slate, and where exposed in the creek it is 3′ wide. There are three parallel veins on the property. Excepting a 50′ tunnel and some shallow shafts, the property is not developed. Along the creek-bed is some good placer ground. Two men are at work. D. W. Reese and C. Jennings, of Coutolenc, owners.

Mount Ida Mine (Quartz).—It is 2½ miles N.E. from Hurleton, at 1,430′ elevation. The vein strikes N. and S. and dips 54° W. between diorite walls, showing an 18″ vein. There is a 25′ shaft sunk on the vein, which shows a heavily mineralized rock; also several open cuts and a short tunnel. Three men are at work. J. Pullen, of Hurleton, owner.

Napa and Solano Counties Co.'s (*Best*) *Mine* (Drift).—It is 3 miles W. of Lovelocks, at 2,100′ elevation, and comprises 40 acres. It is on an old channel with a S.W. course, and opened through a bedrock tunnel 650′ in length, from which there is a 30′ upraise into the gravel, which is breasted from 50′ to 100′ wide and from 5′ to 6′ high, and has been worked 600′ in length. The main tunnel is being driven ahead at present. Wash water is taken from the mine. There are 100′ of 12″ sluices with cross-riffles. Seven men are employed. J. M. Reams, of Suisun, Solano County, owner; J. Zweifel, of Lovelocks, superintendent.

New Oregon (*Forty-nine*, *Red Point*) *Mine* (Quartz).—It is 1½ miles E. of Enterprise, at 1,625′ elevation, and comprises 160 acres of patented ground. The vein strikes E. and W., dips 60° S., between slate and porphyry walls, showing 12′ in width. The quartz contains 0.5% of sulphurets, principally iron and lead. A cross-cut tunnel has been driven 150′ to the vein, giving 120′ of backs; a second tunnel, 150′ lower, has attained a length of 140′, but will require 350′ more to reach the vein. Short drifts of 30′ have been made on the vein in the upper tunnel. Nine men are employed, An incorporated company, owner; J. Champion, of No. 1921 Alice Street, San Francisco, superintendent.

Nimshew Gold Mining Co.'s (*Pewperingtuno*) *Mine* (Drift).—It is ½ mile W. of Nimshew, at 1,625′ elevation, and comprises 400 acres of ground. There are five channels on the company's ground, known as the *Blackleg*, *Cole*, etc. Their general course is N. 47° E., and they are from 10′ to 40′ in width, with 2′ average depth of gravel. The present workings consist of a 6′x 6′ tunnel running 1,300′ N.E. on the channel; the gravel is washed with 50 inches of water brought from springs owned by the company, through 13″ to 7″ pipe, under 47′ pressure, through sluices 14″ wide and set on a 10″ grade and furnished with slate riffles. The gold is coarse. On the Blackleg channel there is a 1,600′, and on a branch channel a 1,100′ tunnel. Seven men are employed. A San Francisco company, owner; G. C. Higgins, of Nimshew, superintendent.

Oliver Twist Mine (Placer).—It is 4 miles N. of Inskip, in Sec. 16, T. 25 N., R. 4 E., at 4,725′ elevation, and comprises 120 acres. Idle. Cassius A. Oliver, of Chico, owner.

Oro Fino Mine (Drift).—See our VIIIth, XIth, and XIIth Reports, pp. 118, 160, and 86. It is 5½ miles N.W. of Magalia, at about 2,100′

elevation, and comprises 270 acres. Since our last report the main tunnel has reached 2,700′ in length; at present idle, and awaiting a blower and pipe-line to secure necessary ventilation. L. Cohn, M. Goodday, and others, of Magalia, owners.

Owl Mine (Quartz).—It is 2 miles N.W. from Inskip, at 3,925′ elevation. The vein strikes N. and dips W., in porphyry, and shows a mere seam of extreme richness, which is followed into the hill by an open cut, at present covered by a slide which is being ground-sluiced. An old 8′ arrastra driven by a breastwheel is on the property. One man is at work. C. R. Parker, of Inskip, owner.

Pactolian Mine (Quartz).—It is 2 miles N. of Hurleton, at about 1,600′ elevation. The vein strikes N.E. and S.W., and dips S.E., between diorite slate walls, varying from 2′ to 8′ in width. A contract has been let to drive the tunnel 100′ ahead, which will be over 400′ long. Four men are at work. J. E. Miller, of San Francisco, owner; D. A. McDonald, of Hurleton, superintendent.

Palace Mine (Drift).—It is 2 miles W. of Lovelocks, at 2,100′ elevation, and comprises 260 acres. The course of the channel is N.E.; it is about 80′ wide, with 2′ to 4′ of gravel. It is lava-capped and with a sediment roof. The gravel consists of quartz and slate. The 6′ x 8′ main bedrock tunnel is 300′ in length, and a gangway is continued 1,250′ up the channel. Eight hundred feet of the channel has been breasted out, carrying 3′ of bedrock with the gravel. The gravel is washed through the tunnel with 60 inches of water from the Cherokee ditch. The flume has a 10″ to 16′ grade, and is cleaned up once per month. The tailings dump on the hillside facing Big Butte Creek. Two men are at work. Thompson, Doolittle & Co., of Nimshew, owners.

Palo Alto Mine (Quartz).—See our Xth and XIth Reports, pp. 129 and 164. It is 3 miles N. of Merrimac. The mine and the 2-stamp and 10-stamp mills are idle. Palo Alto Mining Co., of Merrimac, owner.

Parry (*Alki*) *Mine* (Drift).—See our Xth, XIth, and XIIth Reports, pp. 141, 161, and 87. It is 4 miles N.E. of Magalia, at 1,700′ elevation, and comprises 320 acres. Since our last Report a new 30′ overshot wheel has been built to handle the four pumps of 9″, 7″, 6″ and 5″, which raise 250 gals. of water per minute. The shaft has reached a depth of 1,000′ on the incline. Water is obtained from main west branch of Feather River through 12 miles of ditch, with a capacity of 300 miner's inches. One man is at work. — Parry, of Magalia, owner.

Perschbaker Mine (Drift).—See Magalia Drift Mining Co.

Peweringtuno Mine (Drift).—See Nimshew Mining Co.

Phœnix Gold Mine (Quartz).—See our XIIth Report, p. 87. It is in Sec. 26, T. 19 N., R. 5 W., 3 miles S. of Hurleton, at about 1,600′ elevation, and comprises three claims. Idle. J. L. Gibson et al., of Hurleton, owners.

Pinkston Mine (Quartz).—It is 10 miles E. of Yankee Hill, at 2,300′ elevation. The vein strikes N. and S., and dips nearly vertically E. in slate rock, with a width of 2½′ to 4′. A tunnel, now 80′ long, is being driven on the vein, where a perpendicular depth of 60′ is obtained. There is a 5-stamp steam-power mill on the property, with 250-lb. stamps, capable of crushing 5 tons in twenty-four hours. The ore carries barium, and is low grade. Five men are employed. William Pinkston, of Yankee Hill, owner.

Porphyry Point Mine (Drift).—See our XIIth Report, p. 88. It is 3 miles N. of Magalia, and comprises 30 acres on the channel. R. Shiplet et al., of Magalia, owners.

Poumarat Mine (Quartz).—It is on Little Butte Creek, 1½ miles N.W. from Lovelocks, at 2,600′ elevation. The 2′ vein strikes N. and S., and dips 45° E., between slate walls. A 6′ x 8′ double-compartment incline shaft has been sunk 100′ without a hoist. At 70′ depth a drift has been run on the vein 100′ N. Two men are at work. V. Poumarat, of Coutolenc, owner.

Princess (*Aurora*, *Church*) *Mine* (Drift).—It is 2½ miles N.E. of Magalia, at 2,400′ elevation, and comprises 320 acres. It is presumed to be on the same channel as the Perschbaker Mine, and has a N. 30° E. course, with a width of about 70′ on serpentine bedrock. The blue gravel is about 3′ deep, and carries coarse gold with 65% of cobbles and bowlders that are stored in the mine. There is an incline shaft 330′ deep on a 32° pitch. The present workings are on the east rim, and a cut is being made across the channel. The output of gravel averages 30 cars of 10 cu. ft. each, per day. There is a steam hoist, and the pumps are run by water-power derived from Little Butte Creek for part of the season; the remainder of the time 40 miner's inches are taken from the Cherokee ditch; the ditch is 1¼ miles, 4′ on top, 2½′ on bottom, and 18″ deep. The gravel is washed through 80′ of 14″ flume, set on a grade of 9″ to 12′, and furnished with Hungarian and slat riffles. Eight men are employed. An incorporated company, of Magalia, owner; G. E. Hogg, of Magalia, superintendent.

Rainbow Mine (Quartz).—See our Xth and XIth Reports, pp. 131 and 158. It is on Jordan Hill, 4 miles W. of Yankee Hill. Idle. Capt. Griffith, of San Francisco, owner.

Ramona (*Skipper*) *Mine* (Quartz).—It is on the west branch of the Feather River, 1½ miles S. of Magalia, at 1,900′ elevation, and comprises 40 acres. The veins strike N. 65° E., and dip 75° S.E. There are two veins in syenite, 3½′ and 10′ wide. There is a tunnel 46′ long on one of the veins, which gives 200′ of backs. An old 10-stamp mill, with 850-lb. stamps and double-discharge mortars, is arranged to be run by water, the Cherokee and Miocene ditches both crossing the property. The quartz is well mineralized, and said to carry high-grade sulphurets. Six men are employed. C. H. Ford, A. W. Morgenstern, and E. C. Hughes, of Magalia, owners; C. H. Ford, of Magalia, superintendent.

Rawhide Mine (Quartz).—It is 2 miles N. of Inskip, at 4,300′ elevation, and comprises 1,500′ by 600′. The vein, 4′ to 30′ in width, has a N. and S. course, dipping 75° E. between slate walls. A 5′x 6′ incline, 25′ deep, has been sunk on a stringer from the main vein, and 25′ of a tunnel run on the stringer nearly at right angles to the main vein. Four men are employed. Wylie Bros., of Inskip, owners.

Red Point Mine (Quartz).—See New Oregon.

Republican Mine (Drift).—See our XIIth Report, p. 88. It is on the Forks of the Butte, 4 miles N. of Lovelocks. P. N. Woods, of Lovelocks, owner.

Resumption Mine (Quartz).—It is 3½ miles E. of Hurleton, at 1,800′ elevation. The vein strikes N.E. and dips N.W. in a decomposed formation, with a varying width up to 2′. A tunnel is being driven on the vein, and the ore is being worked in the Phœnix mill. Four men are employed. W. W. McMillan et al., of Hurleton, owners.

Rock River Mines (Quartz).—They are in Secs. 4 and 9, T. 20 N., R. 4 E., 9 miles N. from Oroville, at 1,200′ elevation, and embrace nine claims bonded to the Golden Gate Syndicate (Limited). Three claims belong to the Rock River Mine proper. The main works are on a vein with a N. 48° W. strike and a 45° S.W. dip. The formation is badly broken up, showing slate and diabase interlaced with quartz seams, the wall rocks being highly mineralized. The vein varies from 20″ to 3′ in width, and shows free gold in connection with arsenical pyrites. An incline on the vein is 300′ deep, with three levels run off, extending 300′, 275′, and 160′ N., and on two levels, 100′ S. A 15 H.P. engine furnishes the motive power for the hoist and a No. 4 Dow pump. Ten men are at work. — Fugua, of Oroville, superintendent.

Scott Bar Mine (Placer).—It is 4½ miles W. of Lovelocks, at 900′ elevation, and comprises 1,400′ by 2,800′ in two parallel claims. A bar on the channel of Big Butte Creek is being prospected. Water is taken from Big Butte Creek through 3½ miles of ditch of 300 miner's inches capacity and delivered under 100′ head. Idle. N. Logan, of Lovelocks, superintendent.

Shakespeare Mine (Quartz).—See our Xth, XIth, and XIIth Reports, pp. 128, 163, and 88. It is at Forbestown. Idle.

Skipper Mine (Quartz).—See Ramona.

Slater Mine (Quartz).—It is 2½ miles E. of Enterprise, at 1,100′ elevation. The vein strikes E. and W., dips N. in granite, and varies from 7½″ to 4′ in width. It has been developed by a cross-cut tunnel 190′ long, connecting with a 4′x 5′ shaft, sunk 200′ on the vein. But little stoping has been done. A steam-power arrastra, 10′ in diameter, is connected with the tunnel by a tramway, and has a capacity of 6 tons a day, which is discharged into a settler after four hours' grinding. A water-right belongs to the property; water is diverted from Slater Ravine through 2½ miles of ditch, 15″ on the bottom, 12″ deep, with 16′ per mile grade, and a capacity of 160 miner's inches; it is good for six months in the year, and is delivered under 100′ pressure. Three men are employed. E. W. Slater, of Enterprise, owner.

Spring Valley Mine (Quartz).—See our XIth Report, p. 155. It is 2 miles S.E. of Cherokee, at 1,600′ elevation, and comprises 42 acres. The 5′ vein strikes N. 80° W., and dips 40° E., between greenstone and trachyte walls. Two tunnels have been driven, one above the other, and 50′ apart: No. 1 runs 400′ on the ledge; No. 2 cross-cuts 800′ and has an upraise of 28′ to the vein, on which some drifting has been done. There is a 10-stamp steam-power mill, with 850-lb. stamps, on the ground, but not running. One man is at work. Estate of J. Nesbett, of Cherokee, owner.

Spring Valley Gold Mining Co's. Mine (Hydraulic).—See our VIth (Part II), Xth, and XIth Reports, pp. 24, 124, and 155. It is situated in Secs. 4, 5, 28, 29, 32, and 33 of T. 20 and 21 N., R. 4 E., comprising about 1,500 acres at Cherokee, and is frequently referred to as the *Cherokee Mine*. About 150 acres, with a face of 500′ depth, has been worked to bedrock, while nearly as much has been worked to within 15′ of bedrock. The bedrock gravel is cemented and requires to be disintegrated with powder. On account of litigation the mine has not been worked for a number of years, but several small companies have leased portions of bedrock and old points that were left. These companies use 3 water-power and 2 hand-power derricks, and the company's water. The company have two ditch systems; the first flows into a reservoir at Concow, and the second starts from this reservoir. There are 20 miles of main ditch, pipe, and flume between Cherokee and Concow; the ditch is 5′ wide on the bottom, and of 2,200 miner's inches capacity. The flumes are 5′ wide, and the pipes are 33″ in diameter. The upper system starts from Round Valley reservoir, on the west branch of Feather River, and drops into the Big Butte ditch, near Powellton, which heads 4 miles above on Big Butte Creek, and has a capacity of 2,000 miner's inches, and discharges into the Concow reservoir. The length of the entire ditch system is 80 miles. There are 4 ditch-tenders, and about 100 men working under the leases. An incorporated company, owner; J. B. Whitcombe, of Cherokee, receiver.

Standard Gold and Silver Co.'s Mine (Quartz).—It is at Hengy (Oregon City), 8 miles N.W. of Oroville, at 1,425′ elevation, and comprises two claims, carrying four parallel veins, that have a general N.W. strike and a 35° S. dip, in greenstone and syenite, and are from 18″ to 20″ wide. The quartz is said to carry 1½% of high-grade sulphurets. The pay-shoot is 170′ long, and pitches S.W. A 6′x 9′ single-compartment incline is 487′ deep, with stations at the 100′, 135′, 239′, and 387′ levels. Drifts extend as follows: From the 135′ level, 219′ N. and 227′ S.; from the 239′ level, 197′ N. and 200′ S.; from the 387′ level, 48′ N. and 105′ S. From the south drift of the second level a cross-cut, now 100′ long, is being driven into the foot-wall to intersect a back vein. The ground is stoped from the second level up. Most of the ore is obtained below the third level. The motive power for the whole plant is a 20 H.P. engine. The mine is very wet, and requires 3 Knowles pumps, Nos. 7, 6, and 4, placed at the third and fourth stations, with one as auxiliary, and several Hooker pumps. The ore, when hoisted, is delivered direct to the grizzly and rock-breaker, and is reduced in a 4′ Bryan roller-mill, working 52 revolutions per minute, and crushing 10 tons per day. The pulp is passed to a Midas amalgamator, running 35 revolutions per minute. The mill contains two Frue vanners, driven by a 4 H.P. engine. Twenty men are at work. An incorporated company, owner; C. M. Wooster, of San José, secretary; W. S. Williams, of Hengy, superintendent.

St. Lawrence Mine (Quartz).—It is 2 miles N. of Inskip, at 4,325′ elevation, and comprises 825′ by 600′. The vein courses N.W., and dips E., in slate. It is developed through a few cuts and shallow pits. Idle. J. D. Williams, of Inskip, owner.

Strang's Mine (Drift).—It is ¼ mile W. of Hengy (Oregon City), at 1,375′ elevation, and comprises 240 acres, embracing an ancient channel. A tunnel was run 400′, but found to be too high; a shaft, now 50′ deep, is being sunk below the tunnel level, and is in pipe-clay and bowlders. From the surface indication and float a paying quartz vein crosses this claim, though it has not been definitely located. Two men are at work. C. Strang and L. Bottcher, of Hengy, owner.

Turner Mine (Drift).—See our XIIth Report, p. 89. It is 1 mile E. of Bangor, and comprises 1,000′ on the channel. Idle. Turner Drift Mining Co., of Marysville, Yuba County, owner.

Westcott Mine (Drift).—It is on the south edge of Philbrook Valley, at 6,000′ elevation, and comprises one claim on the same channel and adjacent to the Butte King and Butte Queen mines. There is a 600′ tunnel in bedrock on west rim, with inclines on 4½% grade and 30′ apart to the channel. The gravel is hard and mostly quartz, and carries coarse gold. Four men are employed. C. Westcott, of Powellton, owner.

Wild Yankee (*Bessie*) *Mine* (Quartz).—It is 3¾ miles N.W. from Inskip, at 3,925′ elevation. The claims cover three veins, striking N.E., and dipping nearly vertically. The principal vein is 4′ wide in a syenite formation, and is prospected by a tunnel and several open cuts. On the other veins there are two tunnels and an incline. The rock is reduced in an 8′ water-power arrastra. Two men are employed. C. T. Salisbury and C. E. Bloomfield, of Inskip, owners.

Wilson Mine (Drift).—It is 3½ miles N. of Magalia, at 2,500′ elevation, and comprises about 1,200 acres. A vertical three-compartment shaft has been started for the bedrock 200′ below, and is supplied with a steam hoist. A tunnel has been driven 300′ on and in the bedrock. None of the channel has been developed yet. Twenty-five men are employed. Gold Banner Syndicate, of London, owner; S. P. Moody, of Magalia, superintendent.

Woods Mine (Drift).—See our Xth Report, p. 140. It is in Sec. 26, T. 24 N., R. 3 E., and 4 miles N. of Lovelocks. Peter Wood, of Lovelocks, owner.

Wylie Mine (Drift).—See Index.

MILLS IN BUTTE COUNTY.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of Each, in Lbs.	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
					No.	Character.	No.	Capacity.		
Banner	Electric	10	850	40	2 1	Triumph Johnson				
Crystal Hill	Water	4	750	6						
Crystal Peak	Water	2	750	3						
Excelsior	Water	4	350							
Gold Bank	Water	40	800	144	16	Frue	1	3 tons.		4,800 sq. ft.
Golden Summit	Steam	10	850	20	2	Woodbury				
Matheson	Steam	8	850	16						
Pinkston	Steam	5	250	10						
Rainbow	Water	5	750							
Ramona	Water	10	850							
Spring Valley	Steam	10	850							

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN BUTTE COUNTY.

Name of Mill or Mine.	Power.	Number	Character.	Diameter	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
						No.	Character.	No.	Capacity.		
Catskill		2	Arrastra	10′	60						
Clarke Bros.	Steam	1	Arrastra	12′	4						
Edna	Water	1	Arrastra	8′							
Owl	Water	1	Arrastra	8′							
Phœnix	Water	1	Bryan	4′	12	1	Johnson				40′ long.
Slater	Steam	1	Arrastra	10′	6						
Standard	Steam	1	Bryan	4′	11	2	Frue				
Wild Yankee	Water	1	Arrastra	8′							

Calaveras County.

The long-continued success of the great gold mines at Angels has done much to attract attention to this and Tuolumne County, and to establish confidence in the large gold-bearing veins found all along the great gold belt. Carson Hill, which two years ago was almost deserted, has again become the scene of active operations, and no less than four separate companies are now at work reopening the famous mines which astonished the world with their richness in the early fifties. Between Carson Hill and Angels there are now in operation five mines, where in 1893 there was but one. These are all old locations and are being developed mostly by foreign capital. Smith's Flat has also revived, and the country between Angels and San Andreas is being prospected with encouraging results. In the immediate neighborhood of San Andreas new and promising mines have been opened, and near Mokelumne Hill the Esperanza Mine, so long idle, has been rehabilitated and is now said to be operated successfully. The Gwin Mine, which was closed about 1880, is being reopened and is looked upon as one of the coming mines of the county. The "East Belt" has been more active than for many years; prospectors are scouring cañon and hillside, and encouraging reports are frequently heard from that section.

The copper industry is improving very slowly. The mines at Copperopolis and at Campo Seco are idle and the production of copper for the past few years is from the leaching of great ore-piles. Generally speaking, the outlook for Calaveras is much improved.

Adelaide Mine (Quartz).—See our XIIth Report, p. 89. It is on the south slope of Carson Hill, and ¼ mile E. of Robinson's Ferry. The 100′ shaft is equipped with a water-power hoist. Idle during the past two years. Wood Bros., of Robinson's Ferry, owners.

Alameda Mine (Quartz).—It is 10 miles E. of San Andreas, and on the N. side of Indian Creek. A 100′ tunnel has been driven on the vein, which is 1′ to 4′ thick, and in black slate. The quartz extracted, about 130 tons, has been worked in an arrastra. Tramantin & Co., of Esmeralda, owners.

Allison Mine (Quartz).—See Garner Consolidated.

Allison-Merrimac Mine (Quartz).—It is on Carson Creek, 4½ miles S. of Angels, and consists of two claims worked jointly. A 140′ cross-cut tunnel has been driven on the dividing line of the claims, which encounters a quartz vein 100′ from the mouth, which has been drifted upon from both sides of the tunnel; that to the north exposing a banded vein 1′ to 3′ wide. The tunnel beyond the first vein runs through foliated black slate containing many veinlets of quartz and some pyrite. The entire zone, 40′ or more, is said to be gold-bearing in sufficient amount to constitute pay-rock. A second parallel vein appears to the west of that above, which has not yet been cut in the underground workings. Robert Allison, of Angels, owner.

Alpine Mine (Quartz).—It is 8 miles E. of San Andreas, and has been opened by two tunnels, one of which is 75′ in. The vein is 2′ to 7′ wide, carrying sulphurets of iron, zinc, and lead. The walls are mica schist. A thin dike, heavily sulphuretted, accompanies the vein. A 1,000′ tunnel may be driven, 50′ above the neighboring ravine, and will give 450′ of backs. W. B. Swank, of Mountain Ranch, owner.

Altaville (*Cherokee*) *Mine* (Quartz).—It is 1 mile N. of Altaville, and is equipped with a steam hoist and 8-stamp mill. Idle. B. R. Prince, of Altaville, owner.

Angels (*Fox*) *Mine* (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 141, 150, and 89. Joins the Utica on the north. James V. Coleman, of San Francisco, owner.

Angels Camp (*Turner*) *Mine* (Quartz).—It is 1½ miles W. of Angels, in the lower part of Smith's Flat. A new shaft is being sunk and has reached a depth of 90′. Nine men are employed. Angels Camp Gold Mining Co., of London, owner; J. H. Roberts, of Angels, superintendent.

Ant Hill Mine (Quartz).—It is 2½ miles N.W. of Copperopolis. See Royal Consolidated.

Augostini Mine (Drift).—It is 4½ miles N.W. of San Andreas, near Golden Gate Mountain. The shaft is 200′ deep, and has a substantial hoisting plant. J. J. Augostini, of San Andreas, owner.

Bailey Mine (Drift).—It is ¾ mile N.W. of Camanche. A drain tunnel was being run, in August, 1895, to reach the channel. Four men are employed. D. Bailey et al., of Camanche, owners.

Balaklava Mine (Drift and Hydraulic).—See Meinecker & Sanguinette.

Bald Hill Mine (Quartz).—See Big Spring.

Bald Hill Mine (Quartz).—See Gold Reserve Consolidated.

Banner Mine (Quartz).—It is in the village of Glencoe. The shaft is 200′ deep. The mine and plant have fallen into decay through neglect. Phelps & Miller, of San Francisco, owners.

Banner Mine (Quartz).—See Mayflower.

Banner Blue Gravel (*Shephard*) *Mine* (Drift).—It is 16 miles N.E. of San Andreas, on Jesus Maria Creek. Development work is in progress. Banner Blue Gravel Mining Co., owner; Mark A. Shephard, of San Andreas, superintendent.

Baumhogger Mine (Quartz).—It is ½ mile N. of Altaville. A shaft was sunk 75′ in 1895, when work was discontinued and another started at a different point. Three men are employed. H. & W. Baumhogger, of Angels, owners.

Beatrice Mine (Quartz).—See Mayflower.

Benson Mine (Drift).—It is in Latimer Gulch, 4 miles W. of San Andreas, and is worked steadily, the cemented gravel being crushed in a 3-stamp mill. Four men are employed. Benson & Sons, of North Branch, owners.

Belcher Mine (Quartz).—It is on the Stanislaus River, near Parrott's Ferry. A tunnel has been run 75′ on a small vein of rich rock, which is usually heavily mineralized with auriferous sulphurets. Thomas Smith et al., of Angels, owners.

Belle Mine (Quartz).—See our XIIth Report, p. 90. It is ½ mile above Robinson's. Idle. E. W. Roberts, of Oakland, owner.

Bence Mine (Quartz).—It is at Esmeralda, on Indian Creek. A tunnel has been driven 100′ on the vein a few feet above the creek. Two men are employed. Adam Bence, of Esmeralda, owner.

Big Horn Mine (Quartz).—It is 2½ miles N. of Murphy. The vein is opened at several points along the outcrop for over 300′; the deepest shaft being 35′. A cross-cut tunnel has been driven to, and a drift run 100′ on the vein. The quartz is dark blue, almost black, and has a peculiar, greasy luster. Gold can be seen in many pieces of quartz, and sulphurets are quite abundant. A much decayed, irregular dike accompanies the vein, which occurs in mica schist. There is no machinery on the mine. J. W. Taylor, of Murphy, owner.

Big Spring (Graham, Marble Springs, Bald Hill) Mine (Quartz).—See our Xth and XIth Reports, pp. 150 and 174. It is 1 mile S. of Angels. Has only superficial development. L. Graham, of Angels, owner.

Binum Mine (Quartz).—It is 7½ miles E. of San Andreas. A new prospect, showing a 4′ vein. Floyd Binum, of Mountain Ranch, owner.

Birney Mine (Quartz).—See our XIIth Report, p. 90. It is on the Birney ranch, 1¼ miles N.E. of Angels. In 1893 this mine was opened to a depth of 110′, and a cross-cut run east on the 100′ level. While under bond a 10-stamp mill, a ditch, and a flume were built, and some work done on the mine. The operations were soon suspended. It would probably have been better to have put the cost of the mill into the mine, as the prospect is one deserving more thorough development, but requiring no mill at present. T. L. Birney et al., of Angels, owners.

Bisbee (El Dorado) Mine (Quartz).—It is in Smith's Flat, 1½ miles W. of Angels. Two shafts have been started 40′ apart, presumably on the foot and hanging walls of a zone of amphibolite schist bearing gold. Considerable quartz occurs in this schistose belt in the form of small veins. The old drift is 45′ deep and the new one 115′. In the latter a drift has been driven 30′ south. The surface plant consists of a steam hoist and pump, but too light to control the water. There is also a light 5-stamp mill used for prospecting. Besides free gold, the quartz contains pyrite and copper glance, rich in gold. Ten men are employed. W. A. Bisbee, of Angels, owner.

Black Gorge Mine (Quartz).—See Lindsey.

Black Wonder Mine (Quartz).—It is 8½ miles S.E. of West Point. There are four veins in the claim, the most prominent ones being called *Black Wonder* and *Eureka*. The development is superficial. The quartz is heavily sulphuretted. Fred Greve, of West Point, owner.

Blair Consolidated Mine (Quartz).—It is 1½ miles W. of Angels. It is said to have considerable development, consisting of a shaft 350′ deep, and several levels, cross-cuts, etc. Information about and admission to the mine were refused by the representatives in charge. Idle. Blair Con. Mining Co., owner; James Schmedake, of San Francisco, superintendent.

Blazing Star Mine (Quartz).—It is 1 mile E. of West Point, and is one of the mines in this district that has been worked steadily during the past two years. The shaft is 450′ deep. During 1895 some cyanide experiments were made on its concentrates by J. D. Morgan, who stated that, from an ore consisting largely of pyrrhotite and chalcopyrite, the gold extraction was 88%; from marcasite, 92%, and from pyrite, 94% of the assay values. It is claimed a 4% solution is employed, to which is added some chemical substance (the nature of which is secret), which prevents, to a great extent, the decomposition of the cyanide. The gold is recovered in the usual manner on zinc shavings. The average extraction on mixed ores is claimed to be 90%. The quartz is crushed through a 40-mesh screen, the height of the discharge ranging from 4″ to 6½″. Concentration is effected on Frue vanners and an 18′ canvas table. Ten men are employed. W. E. Foster, of West Point, owner.

Blue Bell Mine (Quartz).—It is 1½ miles N. of Glencoe. A prospect tunnel has been driven on the vein. Scott & McIntyre, of Toledo, Ohio, owners.

Bolytho (*Hardy*) *Mine* (Quartz).—See our XIIth Report, p. 93. It is 1 mile S. of Angels, and is supposed to be on the same zone as the Utica-Stickle Mine. A large amount of superficial work has been done. The principal development consists of two tunnels driven near the base of a hill 150′ high. They are each over 200′ long and have lengthy cross-cuts. The entire ore-channel is in amphibolite schist, in which are numerous quartz veins, large and small. Both quartz and schist contain gold and auriferous iron-sulphurets. A new shaft was commenced in September, 1895, and is to be sunk several hundred feet. Eight men are employed. A. N. Butts, of Angels, owner.

Bonanza Mine (Placer).—It is in Quartz Gulch, 1 mile N. of Murphy. Said to have produced a large amount of gold in former years. It is to be reopened. E. C. Loftus et al., of Sonora, owners.

Boston Mine (Quartz).—See Esperanza.

Boston (*North Hill*) *Mine* (Hydraulic).—It is 2 miles S.E. of Jenny Lind, and is one of the mines shut down by the anti-debris law. A force of men are cleaning bedrock, tearing out old flumes, etc. The gravel deposit was originally several hundred feet wide, and a large portion still remains unworked. The water used in mining here is obtained from the large reservoir in Salt Spring Valley. Twelve men are employed. Boston Gold Mining Co., owner; J. H. Southwick, of Milton, superintendent.

Brown, Smyth, and Ryland (*Suffolk or Smyth*) *Mine* (Quartz).—It is ¾ mile N.W. of Angels. A 400′ cross-cut tunnel has been completed since our previous Report. It has intersected three gold-bearing veins of good size. Brown, Smyth, and Ryland Gold Mining Co., of Angels, owner.

Brazza Mine (Quartz).—It is 2½ miles N. of Esmeralda. A shaft has been sunk 70′ and several open cuts made along a dike which, near the surface, is much decayed. Lying under the dike is a gouge-like material 12″ thick, with a thin seam of quartz, usually lying next to the dike. In the gouge and quartz, pockets of coarse gold have been found. Antonio Leech et al., of Esmeralda, owners.

Bruner Mine (Quartz).—See Gold Reserve Consolidated.

Buckhorn Mine (Quartz).—See our XIIth Report, p. 90. It is 1 mile W. of Murphy. During the past three years considerable prospecting has been done. A tunnel to tap the old workings is being run, but has not reached them. Two men are employed. Buckhorn Cons. Mining Co., of Napa, Napa County, owner.

Buckminster Mine (Drift).—See Uptograph.

Calaveras Consolidated (*Santa Cruz*) *Mines* (Quartz).—See our Xth and XIth Reports, pp. 56 and 169. They are 7 miles S. of Angels, extending from the Stanislaus River up the south slope of Carson Hill. The new shaft, commenced in 1893, reached a depth of 500′, when work was suspended, and the mine remained idle until the summer of 1895, when the long tunnel near Robinson's Ferry was cleaned out and retimbered. Ten men are employed. Calaveras Cons. Mining Co. (Ltd.), of England, owner; P. F. Wood, of Robinson's, agent.

California (*Hicks*) *Mine* (Quartz).—It is 9 miles E. of San Andreas.

Prospecting work is in progress. Two men are employed. Frank Cuneo et al., of Esmeralda, owners.

Canape Mine (Quartz).—It is 1 mile W. of Carson, and has a 75′ shaft on a small vein of rich quartz. Joseph Canape, of Angels, owner.

Carlton Mine (Quartz).—It is 4 miles W. of West Point, on the north side of the Middle Fork of the Mokelumne River. The vein is about 10″ wide. The fissure is well defined, and the quartz high grade. It is crushed in arrastras. A series of dikes cut the vein at varying distances, and are parallel and dip into the mountain at an angle of 45°. The pay-rock is found on both sides of the dikes. The intrusion of the dikes is evidently subsequent to the formation of the vein. The mine is opened by several adits, the longest being 200′. Three men are employed. T. Carlton, of West Point, owner.

Carson Creek Mine (Quartz).—See our XIth and XIIth Reports, pp. 173 and 91. It is on Carson Creek, 1 mile W. of Robinson's, at 900′ elevation. The mine has a shaft 660′ deep, the first 75′ of which is vertical, the remainder being on a 45° angle; it is now proposed to reconstruct the upper part by making it conform to the lower. A large new air-compressor is to be put in at once, and the mine systematically developed. The hoist and 40-stamp mill are run by water-power. Forty-two men are employed. Carson Creek Mining Co., of Watertown, N. Y., owner; Naylor Williams, of Angels, superintendent.

Casnelli (*Mullen*) *Mine* (Quartz).—It is 4½ miles W. of San Andreas. It has a tunnel 600′ long, which connects with a shaft 60′ from the surface. Two men are employed. D. Casnelli, of San Andreas, owner.

Central Hill Mine (Hydraulic).—See our XIIth Report, pp. 91 and 482. It is ¼ mile S.W. of Murphy. The drain tunnel from Douglas Flat, commenced in 1892, was completed in 1894, and is 3,300′ long. A permit was obtained from the U. S. Debris Commission to mine by the hydraulic method, and active mining operations commenced. When water becomes scarce, in the latter part of summer, preparations are made for the winter and spring campaign by breaking up large masses of ground by heavy charges of powder. The south pit of the mine has been carried to the rim of a deeper channel, which has cut directly through the old Central Hill channel at a right angle. The drain tunnel passed 500′ through this later channel, which was previously unknown; the upper portion is filled with coarse sand. All attempts thus far made to reach bedrock in the sand-channel have failed, owing to the large amount of water encountered. The Central Hill channel continues on its regular course south of the crossing of the sand-channel. Twelve men are employed. Central Hill Mining Co., owner; W. Thomas, of Douglas Flat, superintendent.

Champion Mine (Quartz).—See our XIIth Report, p. 91. It is 2 miles W. of West Point. S. Rufino, of West Point, owner.

Chaparral Hill Mine (Quartz).—It is on the north slope of Chaparral Hill, 3 miles S. of Angels. It is opened by tunnels, the lower one being several hundred feet long. Idle. E. K. Stevenot, of Sonoma, owner.

Cherokee Mine (Quartz).—See Altaville.

Chapellet Mine (Drift).—See El Encino.

Cleveland Mine (Quartz).—See Empire Consolidated.

Cloud Mine (Quartz).—See our Xth Report, p. 148. It is 2½ miles S.W. of Angels, near the road to Carson Creek Mine. It has two shafts, 45′ and 60′ deep, respectively, a cross-cut tunnel, and a large open cut. At and near the surface, the vein is found in black slates, dipping 55° E., but a short distance from the surface it becomes nearly horizontal, entering and cutting across hard, splintery diabase. Several thousand dollars were obtained from a pocket in the cut where the vein assumes a horizontal position. In a shaft south of the cut some rich arsenical ores have been found. Two men are employed. Otto Dolling, of Angels, owner.

Coffee-Mill Mine (Drift).—It is 4 miles S. of Mokelumne Hill, on the east slope of Golden Gate Mountain, and is on the Kreamer channel. The gravel is raised by a steam hoist, and washed in a large puddling box. A shaft is to be sunk to open new ground. Twenty-six men are employed. Coffee-Mill Mining Co., owner; James L. Gleason, of Mokelumne Hill, superintendent.

Comet Mine (Quartz).—It is 2 miles N. of San Andreas. Some years since a large open cut was excavated here and two cross-cut tunnels, 300′ long, run to the cut from the east. A 20-stamp mill was built and a large quantity of rock (chlorite schist, diabase, and quartz) crushed, but, notwithstanding the exceptionally favorable facilities for economical mining and milling, work was stopped and the machinery removed. Ira H. Reed, of San Andreas, owner.

Cook Mine (Quartz).—See our XIIth Report, p. 91. It is 1½ miles N.E. of Angels. Assessment work only is done. S. Cook, of Angels, owner.

Cosgrove Mine (Quartz).—It is on the west hillside, in the town of Angels. There are two known veins within the limits of the claim. The east one is very similar to many others in this vicinity, being a somewhat irregular vein of quartz in altered diabase, which is often included in the vein in the form of chloritic or talcose material, both quartz and schist carrying gold and auriferous sulphurets. A vertical shaft has been sunk 100′ on the vein, showing some improvement with depth; 200′ west of this vein a second mineral zone occurs in amphibolite schist, granular diabase lying between the two veins. A cross-cut tunnel has been driven 100′ into the hill, in soft schists highly mineralized. The main shoot lies on the foot-wall side of the zone, where is found a concentration of sulphides of iron and copper containing gold. It is unlike any of the other mines thus far opened about Angels. Charles Cosgrove, of Angels, owner.

Costa Mine (Quartz).—See Gold Reserve Consolidated.

Crystal Mine (Quartz).—See our Xth Report, p. 61. It is in Angels, a short distance west of the Stickle Mine. Estate of James G. Fair, of San Francisco, owner.

Culbertson Mine (Quartz).—It is 1½ miles N. of San Andreas, near Murray Creek. A cross-cut tunnel, now in 175′, is being driven, which will reach the vein in about 400′. Two men are at work. Culbertson & Strough, of San Andreas, owners.

Curtis Mine (Quartz).—See Star of India.

Cushing (Marshal) Mine (Quartz).—It is between Angels and Altaville. — Cushing, of St. John, New Brunswick, owner.

Dalmatia Mine (Quartz).—It is 2 miles E. of Esmeralda, on Indian Creek. The mine has been opened by a tunnel, 175′ in length, at the end of which a drift has been run on the vein; from this a winze has been sunk 70′, and a second level opened near the bottom. The walls are about 22′ apart, and in the zone lying between them veins of quartz, from mere seams to 6″ in width, have formed, dipping across the zone to the west and pitching along the ore-channel to the north. In these seams and veins the gold has been found, chiefly in masses, from a few cents to several hundred dollars in value. The quartz taken from the mine is worked in a water-power arrastra, after all the visible gold found in the pockets has been removed by hand-sorting. Two men are employed. Joseph Tramantin et al., of Esmeralda, owners.

Dean Mine (Quartz).—It is in Salt Spring Valley, near the Angels road, 8 miles E. of Milton. The vein is in, and forms a portion of, a dike cutting the black slates of the Mariposa formation. The dike rock is sometimes gold-bearing. The vein strikes N. and dips 20° W. The rock is crushed in a 2-stamp mill. Two men are employed. Mrs. V. M. Dean, of Milton, owner.

Deer Lodge Mine (Quartz).—See Pierce.

Dodson & McQuig Mine (Quartz).—See McQuig.

Donnelan Mine (Quartz).—It is 2 miles N. of San Andreas. A large open cut has been excavated, showing numerous small quartz and calcite veins in a much-decayed rock, probably diabase. Most of these veins dip west. One vein, 4′ wide, dips 40° E. A 5-stamp mill belonging to the property stands near the cut on the bank of the Calaveras River. A new ditch, to furnish a larger water-supply, is being constructed, and it was said ten stamps were to be added to the mill, as it was the intention to mill all the rock taken from the open cut. Should this prove unprofitable, then the richer shoots, streaks, and veins will be mined independently. Idle in August, 1896. John Donnelan, of San Andreas, owner.

Dora Mine (Quartz).—See our XIIth Report, p. 92. It is 3 miles N. of Murphy. A large amount of work has been done on this mine, including two tunnels, each several hundred feet in length, and a shaft 75′ deep. Most of the work has been done on a fine-appearing vein of blue ribbon rock, 4′ wide, that contains little or no gold. A new 5-stamp mill, ore-chutes, tramways, well-graded roads, etc., form a part of the property. Idle. Dora Mining Co., of San Francisco, owner.

Dublin Mine (Quartz).—It is 4 miles N.W. of Copperopolis, near the southern end of Salt Spring Valley. An incline had reached a depth of 90′ in August, 1895, and exposed a vein of quartz in a dike which appeared much seamed and broken. The quartz occurs in a succession of swells and pinches along or near the hanging-wall side of the dike, and always within it; the quartz replacing the dike. Four men are employed. James Adams, of Copperopolis, owner.

Dunlap Mine (Quartz).—It is in Salt Spring Valley, near Towers' Ranch, 8 miles E. of Milton. Considerable gold, it is said, has been taken from superficial workings, the rock being crushed in a 2-stamp mill belonging to the property. A new vertical shaft had reached a depth of 70′ in August, 1895. Three men are employed. F. Kuhn, of Milton, owner.

Eclipse Mine (Quartz).—It is 1½ miles N.W. of Angels, and has a 150′ shaft. Idle. T. E. Flagg, of Angels, owner.

Edna Mine (Quartz).—See our XIIth Report, p. 92. It is 3 miles N. of San Andreas, near Spring Gulch. The shaft has been sunk since the last Report to a depth of 145′, and cross-cutting and drifting done. Edna

Mining Co., of San Francisco, owner; J. S. White, of San Andreas, superintendent.

El Dorado Mine (Quartz).—See Bisbee.

El Encino (*Chappellet*) *Mine* (Drift).—It is in Chile Gulch, 4 miles S. of Mokelumne Hill. A new drain tunnel of several hundred feet in length was being driven in the summer of 1895. It has a 10-stamp mill. Three men are employed. El Encino Co., of Oakland, owner; James A. Regan, of Mokelumne Hill, superintendent.

Emma Mine (Quartz).—See Royal Consolidated.

Empire Consolidated Mines (Quartz).—They are 3½ miles N.W. of Copperopolis, and comprise a group of four claims, viz.: *Cleveland*, *Empire*, *Jumbo*, and *Uno*. Of these, the Empire was the only claim being worked. A cross-cut tunnel has been driven 240′ to the vein, where a level was run and winzes sunk. The quartz occurs as a replacement of the upper side of a dike, forming in a series of swells. The black slates of the Mariposa formation lie almost in contact with the vein on the foot-wall side, diabase forming the hanging-wall. The vein dips at an angle of 20° E. In some places the dike is entirely replaced by massive quartz. Eleven men are employed. F. B. Livingston, of San Francisco, superintendent.

Enterprise Mine (Quartz).—See Melones Consolidated.

Esmeralda Mine (Quartz).—See our VIIIth Report, p. 133. It is at Esmeralda, 10 miles S.E. of San Andreas. The vein occurs in the slates of the Calaveras formation, accompanied by a dike rock which forms a portion of the pay-shoots. There are two shafts, 100′ and 400′ deep, respectively. The latter has been retimbered to water level. The mine has recently been reopened. Hon. John F. Davis et al., of Jackson, owners.

Esperanza (*Boston*) *Mine* (Quartz).—See our XIIth Report, p. 90. It is on Indian Creek, 2 miles N.E. of Mokelumne Hill. After an idleness of several years it is being reopened. The inclined shaft has reached a depth of 340′, and levels run cross-cutting the vein diagonally. Several upraises were also made, and chutes built preparatory to stoping. On a level with the collar of the shaft an adit had been run several hundred feet on the vein, with numerous cross-cuts and branches. Some stoping had been done here in former years. The mineral zone exposed by these workings is from 40′ to 60′ wide, consisting of veins, stringers, and large, irregular masses of quartz in chlorite and talcose schists. The rock within this zone contains gold and auriferous sulphurets of iron, copper, lead, and zinc. The old 20-stamp mill has been almost entirely rebuilt, and 10 stamps more are to be added immediately. Fifty-five men are employed. Wm. Stewart, of Mokelumne Hill, superintendent.

Eureka Mine (Quartz).—See our XIIth Report, p. 92. It is 1 mile N. of West Point. Equipped with steam hoist and a 5-stamp mill. Idle. Joel Rowe, of West Point, owner.

Everlasting Mine (Quartz).—See our Xth and XIIth Reports, pp. 63 and 92. It is ½ mile S.W. of San Andreas. Patented. N. Seiffort, of San Andreas, owner.

Excelsior Mine (Quartz).—It is at Angels, a short distance E. of the Gold Cliff. It has a 120′ cross-cut tunnel and a 75′ shaft. John Meyers, of Angels, owner.

Excelsior Mine (Quartz).—It is a prospect, 1¼ miles N.E. of Mokelumne Hill. It has a 100′ tunnel. C. Peek, of Mokelumne Hill, owner.

Falcon (*Louisa, Carley*) *Mine* (Quartz).—See our XIIth Report, p. 94. It is 2½ miles W. of Murphy. Reopened in 1895. The shaft is 215′ deep, with a drift 50′ E. at that level. An adit was run several hundred feet, years ago, which connects with the shaft. The property is equipped with a steam hoist and 5-stamp mill. Fifteen men are employed. McCarthy Bros. & Hooper, of No. 113 Front Street, San Francisco, owners; W. H. Hooper, of Murphy, superintendent.

Fellowcraft Mine (Quartz).—See our Xth, XIth, and XIIth Reports, pp. 149, 178, and 92. It is situated in the eastern outskirts of San Andreas, and has been reopened after an idleness of several years. A shaft has been sunk 216′ at an angle of 54°, and levels started at 50′, 100′, and 200′ depth, and a cross-cut run 100′ in the foot-wall country rock at the 100′ level. The surface plant consists of a steam hoist and air-compressor. A 10-stamp mill is being built. Twenty-three men are employed. Fellowcraft Mining Co., of Cleveland, Ohio, owner; T. L. Hobbs, of San Andreas, superintendent.

Fenian Mine (Quartz).—It is 5 miles N. of Murphy, near the Old Calaveras Mine, and has a shaft 90′ deep, now caved. Idle.

Fine Gold Mine (Quartz).—See our VIth Report (Part II), p. 34. It is 5 miles N.E. of Railroad Flat. Idle for years, but it is said operations are to be resumed. J. B. Haggin & Co., of New York, owners.

Finnigan Mine (Quartz).—It is on the east side of Carson Hill, near the Reserve Mine. Tarbut, Bicknell & Co., of Angels, owners.

Flamm Mine (Quartz).—It is 2 miles W. of San Andreas, between Calaveras River and Murray Creek. A cross-cut tunnel to tap the vein is 50′ in. Four men employed. Flamm Bros., of San Andreas, owners.

Foote & Thompson Mine (Quartz).—See Quartz Glen.

Ford Mine (Quartz).—It is ½ mile E. of San Andreas. In former years considerable gold was sluiced from the surface of this mine. These old workings have exposed, in a small gulch, croppings over 100′ wide, consisting of quartz, talc schist, and chloritic rocks. The quartz is much shattered, crumbling and breaking in small fragments with a hackley fracture; the whole mass is stained with iron oxide. In this broad mass a vertical shaft 20′ from the foot-wall was sunk to a depth of 120′. The foot-wall was encountered at 80′ depth. From the bottom of the shaft a cross-cut was driven 103′ E., but no hanging-wall was found. In sinking this shaft some very rich rock was found; telluride of gold and silver being associated with metallic gold. The old shaft was abandoned and a new inclined shaft, 200′ N. of it, was sunk 100′, at an angle of 60°, in the foot-wall. It is thought that this angle will prove to be the average dip of the vein. The shaft encountered some very rich gold and tellurium rock near the 100′ station. It is now 350′ deep, with a drift and cross-cut at 100′, showing a vein 70′ wide, and at 180′ a cross-cut 60′ in quartz. A station and level have also been cut out at 300′ from the surface. The plant consists of a steam hoist. Fourteen men are employed. Ford Gold Mining Co., of San Andreas, owner; C. B. Ford, of San Andreas, superintendent.

Fox Mine (Quartz).—See Angels.

Fritz Mine (Quartz).—It is a claim between Angels and Altaville. Idle. Joseph Eastman, of San Francisco, owner.

Gardella Mine (Quartz).—It is 1 mile W. of Mokelumne Hill. It is worked for pockets. Charles Gardella, of Mokelumne Hill, owner.

Garner Consolidated Mines (Quartz).—This property lies partly in Amador and partly in Calaveras County, on the Mokelumne River, ¼ mile E. of the Big Bar bridge, midway between Jackson and Mokelumne Hill. It consists of three claims, the *Allison* and the *Tripp*, in Amador County, and the *Garner*, in Calaveras County. The Garner is the only one in operation. The vein, from 2′ to 5′ wide, is well defined, and was superficially worked ("coyoted") for a distance of nearly 1,000′, in former years; besides which, a long cross-cut tunnel was run to the vein. A tunnel is now being driven, and a shaft sunk on the vein. The mill is 1,500′ distant from the present workings, and on the other side of the river, in Amador County; they are connected by a tramway, which crosses the river on a suspension bridge of about 300′ span, constructed of old wire mine-cables. The cars descend by gravity to the bridge, across which they are hauled by mules, thence they ascend an incline to the mill by means of a wire rope. The empty cars are hauled to the mine by mules. The mill, wire rope on the incline, air-compressors that furnish air to the drills at the mine, etc., are operated by water-power derived from a 3′ turbine wheel, operating under a 12′ head. About 2,000 miner's inches of water is diverted from the river and carried through a short ditch to the wheel. The mill has 10 stamps, rock-breakers, concentrators, etc., and crushes about 30 tons daily. The manager furnishes the following figures: Cost of mining, about 45 cents per ton; cost of milling, 40 cents per ton; transportation from mine to mill, 15 cents per ton, or a total of about one dollar. Eighteen men are employed. Garner Consolidated Mining Co., owner; S. H. Lucas, of Jackson, superintendent.

German Ridge Mine (Quartz).—See our Xth Report, p. 148. It is on German Ridge, 4 miles N.E. of Angels. Extensive superficial workings were made in search of pockets, and also for copper. One of the old tunnels was driven over 450′ through hard greenstone. On the apex of the ridge is a massive quartz vein, which may be traced several hundred feet, but apparently none of the underground workings have yet reached it. Two men are employed. W. H. Steffler et al., of San Andreas, owners.

Ghost Mine (Quartz).—It lies about 600′ E. of the Utica-Stickle lode, and just outside the town limits of Angels. A new hoisting plant has been built, and the shaft, now down 200′, will be sunk to a depth of 600′. Six men are employed. C. W. Tryon, of Angels, owner.

Gladstone Mine (Quartz).—It is ½ mile S.W. of Murphy. There are six veins in the claim. A tunnel, now 125′ long, has been run to intersect them. E. H. Schaeffle, of Murphy, owner.

Gold Cliff Mine (Quartz).—See our Xth and XIIth Reports, pp. 60, 150, and 92. The great open cut on this mine has grown larger, year by year, until it is now over 500′ long, 150′ deep at the deepest part, and from 20′ to 80′ wide on the bottom, and over 200′ wide at the top. Thirteen men are employed. Hayward et al., of Angels, owners.

Gold Hill Mine (Quartz).—See our XIth and XIIth Reports, pp. 171 and 93. It is on Smith's Flat, 1½ miles N.W. of Angels. The pay zones, of which two are prominent, are in amphibolite schist, much decayed near the surface, heavily mineralized with iron oxides, and are from 10′ to 30′ wide, and about 30′ apart. The open-cut system of mining has been adopted, both shoots being worked by a single excavation. The mill has 10 stamps, crushing, it is claimed, 60 tons of this soft material daily. The brass-wire screen is 20-mesh, with 6″ height of discharge. It is said that the loss in tailings is only slightly greater than when a fine screen is employed. Eleven men are at work. Gold Hill Mining Co., owner; S. V. Ryland, of Angels, superintendent.

Gold Hill (*Lewis*) *Mine* (Quartz).—See our XIIth Report, p. 93. It is a pocket mine, ½ mile S.E. of Vallecito. Burnell & Johnson, of Vallecito, owners.

Gold Reserve Consolidated (*Bruner, Costa, Bald Hill, and Romarggi*) *Mines* (Quartz).—See our Xth, XIth, and XIIth Reports, pp. 59, 174, 90, and 93. They are 2 miles S. of Angels. The principal mine is the *Gold Reserve* (*Bruner*). The developments consist of a shaft 155′ deep, with levels at 60′ and 80′; at the bottom of the shaft a cross-cut had been run 125′ E. In August, 1895, further exploration was commenced by the new owners. The mine is now idle. Consolidated Gold Reserve Mining Co., owner; James Deitrick, of Angels, superintendent.

Gold Valley Mine (Quartz).—It is 2½ miles W. of Angels, and has a 50′ shaft. H. F. Ricketson, of Angels, owner.

Golden Cup Mine (Quartz).—It is 8 miles S.E. of San Andreas. It was discovered since our last Report was issued, and is being worked vigorously. It is one of the peculiar sinks in limestone, such as have been found at Cave City, Columbia, etc. Three men are employed. George Hengen, of Murphy, owner.

Golden Hill Mine (Quartz).—It is 2½ miles W. of San Andreas. The vein is 4′ to 7′ wide, and has been opened by two shafts, 60′ and 100′ deep, respectively, and from these 300′ of drifts run. Within the limits of the claim there are five other undeveloped veins lying parallel, and ranging from 3′ to 50′ wide. Patented. L. A. Irvine et al., of Angels, owners.

Golden Queen Mine (Quartz).—It is 6 miles N. of Murphy, on the divide between Indian and San Antonio creeks. The vein has been opened by three tunnels: the upper one is 200′ long, and connects by a raise with the surface; the middle and lower tunnels are 350′ and 450′ long, respectively. The last has not yet reached the pay-shoot, though driven on the fissure. In the upper workings two shoots are exposed, each 30′ in length and 2′ to 5′ wide. The walls are black slate and the quartz is found to be intimately associated with a dike, the latter sometimes forming a portion of the pay-rock. When this occurs the dike rock is silicious and granular. The quartz is both massive and crystallized, and is for the most part white or gray; but some portions are dark blue. Gold is visible in many pieces of the latter variety. J. E. Genung, of No. 101 Devisadero Street, San Francisco, and others, owners.

Goodenough Mine (Quartz).—See Royal Consolidated.

Gottschalk Mine (Quartz).—It is 1½ miles N.W. of San Andreas, between the Calaveras River and Murray Creek. Years ago a shaft 110′ deep was sunk on the vein; parties holding a bond have sunk a new vertical, three-compartment shaft, 5′x 15′ in the clear, to a depth of 120′; thence to a depth of 193′, with two compartments. The first, 100′ from the surface, is timbered with 6″x 6″ timbers and 4″x 4″ posts. Below 100′ the plates are 6″x 8″, but the 4″x 4″ posts are continued. Such method of timbering is questionable. Though a new shaft in good ground, the wall-plates already show the weight of the walls, and are slowly bending under the pressure. On the surface the vein is 4″ to 6″ wide; several small veins come in as depth is attained, until at the bottom the vein is 7′ to 10′ wide. It is one of the best prospects near San Andreas. A third new shaft is now being sunk, east of the two above mentioned. Six men are employed. C. V. Gottschalk, of San Andreas, owner.

Graham Mine (Quartz).—See Big Spring.

Green Mountain (*McSorley*) *Mine* (Drift and Hydraulic).—It is 1¾ miles S.E. of Mokelumne Hill, on the Tunnel Ridge channel. A permit was issued in 1895 to work by the hydraulic method, but was afterward canceled by the U. S. Debris Commission, owing to the failure of the impounding dam to give satisfactory results. A mill was then built and the mine successfully and continuously worked by the drift method. The mill has 8 stamps of 700 lbs. each. The screen is ¼″ mesh; 120 tons are crushed daily. This mine became noted some years since through the discovery of tons of quartz crystals, some of which were of immense size, weighing over 100 lbs. Beautiful specimens of opalized wood were also found at the same time. Ten men are employed. J. W. Smith, of Oakland, owner; John J. McSorley, of Mokelumne Hill, superintendent.

Gurley Mine (Drift).—It is 4½ miles W. of San Andreas, near Golden Gate Mountain. Sinking on this claim is in progress. Two men are employed. — Gurley, of North Branch, owner.

Gwin Mine (Quartz).—See our VIth (Part II), Xth, and XIIth Reports, pp. 30, 67, and 93. It is 4 miles S.W. of Mokelumne Hill, at 1,050′ elevation. Originally this mine was worked to a depth of 1,540′. All work was suspended in the latter part of 1882, and the mine remained idle until 1894, when a company was organized to reopen the mine. A vertical shaft was started in the hanging-wall slates, 485′ from the vein. Work was commenced May 1, 1894, and has been continuously prosecuted since, with the exception of a period of four months, while trying to tap the old works with a bore-hole and avoid a catastrophe of flooding from the old workings. The 8′x 15′ shaft is 5′x 12′ in the clear, divided into three compartments, and timbered from top to bottom with 12″x 12″ Oregon pine. It is sunk some distance north of the old workings. On August 8, 1896, the shaft was 1,335′ in depth. A station was cut at the 300′ level, and a tank of 4,000 gals. capacity constructed under the floor, for the purpose of taking up the surface drainage. At the 700′ level a station was cut and a reservoir of 12,000 gals. capacity constructed. A cross-cut was run west from the station 374′ through and beyond the vein, the foot-wall being encountered 124′ W. of the shaft. A drift was run 45′ N. and S. at this level on the vein. At the 1,000′ level a cross-cut was run 69′ W. through the vein, 15′ 6″ wide horizontal measurement, the foot-wall being 58′ W. of the shaft. A drift was run 125′ on this level, the vein being found to be 15′ wide; the material is somewhat mixed, but containing some good ore. At 1,195′ the shaft reached the hanging-wall of the vein, which at that point has a gouge 1′ thick. At 1,245′ the foot-wall, hard, black slate, was cut. At 1,307′ a station is now (August, 1896) being cut and chutes built. The development of the mine shows the strike to be N. and S. and the dip 77° E., and that the vein conforms very nearly in both strike and dip with the inclosing black slates. A dike of igneous rock is occasionally found accompanying the vein. It is light gray, fine grained, and appears to be a type of diabase. The surface plant consists of a very substantial water-power hoist, with a 250 H.P. steam equipment, to be used in the event of failure of the water-supply. The grading for a 40-stamp mill is completed, and a contract has been let for a modern 40-stamp mill, complete in every detail, ready to run, including building, concentrators, etc., for $21,004. The shaft is sunk in black slate throughout its entire depth, except where passing through the vein. The following information is furnished by Mr. F. F. Thomas, E.M., superintendent:

The average rate of progress (exclusive of the four months of idleness) was 2′ per day. The cost of sinking, about $36 per foot. The most important items of expense are:

For timber, in place in the shaft	$6 40
For hoisting water, light, etc.	1 00
For the labor of excavation	9 75
For hoisting rock	11 12
Powder, fuse, and caps	1 31
Superintendence, freight, oil, taxes, etc., about	6 42
	$36 00

No power drills were used at any time; no posts are carried in the central portion of the shaft. Twenty-three men are employed. Gwin Mine Developing Co., of San Francisco, owner; F. F. Thomas, of Gwinmine, superintendent.

Hancock Mine (Quartz).—It is a prospect, 2½ miles N.W. of Mokelumne Hill, near Middle Bar bridge. A cross-cut tunnel is being driven to reach the vein, which crops out at the roadside a short distance from the tunnel. C. O. Mitchell, of Mokelumne Hill, owner.

Hard Lead Mine (Quartz).—It is 4 miles E. of West Point. John Allen, of West Point, owner.

Hardy Mine (Quartz).—See Bolytho.

Hartman Mine (Drift).—It is 5 miles S.E. of Mokelumne Hill, on the Old Woman's Gulch channel. George Hartman, of Mokelumne Hill, owner.

Hercules Mine (Quartz).—It is a prospect, 4½ miles N. of Murphy. It has a 250′ tunnel and a 150′ shaft. Two men are employed. Cunliffe & Driver, of Murphy, owners.

Hicks Mine (Quartz).—It is in Salt Spring Valley, 4 miles N.W. of Copperopolis. The vein is found at contact of black slate and a dike, the latter sometimes forming a portion of the vein. It ranges from a few inches to 4′ in width. A cross-cut tunnel has been run 300′ to the vein, connecting with an upraise on the vein 130′ to the surface. John W. McCarty, of Copperopolis, owner.

Holland Mine (Quartz).—It is 1 mile S. of San Andreas. Prospecting work being done in 1896. William Holland, of San Andreas, owner.

Homestake Mines (Quartz).—See our XIIth Report, p. 93. They are at Collierville, 6 miles E. of Murphy. Only assessment work is done. William Collier, of Murphy, owner.

Homestead and Guadaloupe Mines (Quartz).—They are 1¾ miles S.E. of Glencoe. Idle. S. Tyson, of Glencoe, agent.

Horswill Mine (Drift).—It is 5 miles W. of San Andreas, on Golden Gate Ridge. After several years spent in an endeavor to ascertain the location of the channel by means of bore-holes, a long drain tunnel has been started, 400′ below the top of the ridge, and is now several hundred feet in. The plant consists of a gasoline-engine, operating a direct-acting horizontal air-compressor, which furnishes air to the machine drills in the tunnel. The tunnel is driven in black slate and is well timbered and carefully lined. A shaft has also been sunk in the cap, which will be connected with the tunnel when the channel is reached. On account of so much water it has been found impossible to sink to bedrock anywhere on this channel. The development of this property is looked forward too with much interest by owners of other deep claims in this vicinity, as the Horswill Mine appears to be the key to the situation. Four men are employed. G. Horswill, of North Branch, owner.

Hudson Mine (Quartz).—See our XIIth Report, p. 94. It is ½ mile N. of North Branch. Idle. A. Macchiavello, of North Branch, owner.

Hutchinson Mine (Drift).—It is 1 mile S. of Mokelumne Hill, near Chile Gulch. Not continuously worked. Hutchinson & Co., of Mokelumne Hill, owners.

Illinois Mine (Quartz).—See our Xth Report, p. 149. It is on the Copperopolis road, 6 miles S. of San Andreas. The shaft is 130′ deep, and the south drift on the 100′ level has exposed a shoot of pay-rock. B. K. Thorn, of San Andreas, owner.

Infernal Mine (Drift).—It is 3½ miles S.E. of Mokelumne Hill, on the Tunnel Ridge channel, at 1,200′ elevation. This mine has been opened recently. Twenty men are employed. Anthony, Cope & Co., of Mokelumne Hill, owners; Frank Anthony, of Mokelumne Hill, superintendent.

Iron Rock Mine (Quartz).—It is 4 miles S. of Angels, on the north slope of Carson Hill. After years of idleness it is being reopened. A large open cut has been made on the vein, and other underground developments are in progress. The work is being done on a broad zone of quartz and amphibolite schist. Five men are employed. G. W. McNear, of Oakland, owner; — Rouse, of Angels, superintendent.

Jackson Mine (Quartz).—It is ½ mile S. of North Branch. It is worked in a desultory way for pockets. A. & J. Jackson, of North Branch, owners.

Jenkins Mine (Quartz).—It is 1 mile S.W. of Sheepranch. It is a new prospect in schist, accompanied by a dike. The vein is 2′ to 4′ wide. Jenkins & Wheelock, of Mountain Ranch, owners.

Johnson Mine (Quartz).—It is 2½ miles S.W. of Angels, on Long Gulch. A broad mineral zone has been prospected by a cross-cut tunnel 175′ long, and several surface cuts. Thomas Hardy, of Angels, owner.

Jones Mine (Quartz).—It is 2 miles E. of Glencoe. It is an old mine being reopened. It has a shaft 200′ deep. Four men are employed. M. Keating, of Glencoe, superintendent.

Josephine Mine (Quartz).—It is ½ mile E. of Esmeralda, on Indian Creek. A tunnel has been run 300′ diagonally across the slates to connect with a 150′ shaft sunk on the vein. John Saultry, of Esmeralda, owner.

Jumbo Mine (Quartz).—See Empire Consolidated.

Jupiter (*Keefer*) *Mine* (Drift and Hydraulic).—It is on the Central Hill channel, 5 miles S.E. of San Andreas. A reservoir was built in French Gulch this summer to supply this mine. Six men are employed. W. A. Keefer, of Angels, owner.

Keefer Mine (Drift and Hydraulic).—See Jupiter.

Kelly Mine (Quartz).—It is 3½ miles W. of Sheepranch. A tunnel has been driven 180′. J. C. Lewis, of Mountain Ranch, owner.

Keltz Mine (Quartz).—It is 4 miles N.E. of West Point, in granite. Idle. John Morgan, of San Francisco, owner.

Kentucky House Mine (Quartz).—It is 2½ miles S. of San Andreas. Being prospected. John Seiffort, of San Andreas, owner.

Keystone Mine (Quartz).—It is a new prospect at North Branch. J. H. Mester, of North Branch, owner.

Keystone Mine (Quartz).—It is in the village of Railroad Flat. A 100′ shaft has been sunk and a 250′ drift run. The crevice is 22″ wide, with a 12″ pay streak. The formation is black slate. The quartz contains sulphurets of iron, copper, and lead, and mispickel, besides free gold. It was an old mine which was reopened in 1895. Ten men are employed. E. C. Loftus, of Sonora, owner.

Keystone Mine (Quartz).—See Melones Consolidated.

Lamphyre Mine (Quartz).—It is ¾ mile N.W. of Camanche, and is worked through a drain tunnel, the main branch of which is 100′ long. Two men are employed. Larson, Kaiser & Co., of Camanche, owners.

Lane & Tulloch Mines (Quartz).—See Madison.

Last Chance Mine (Quartz).—It is a prospect on Carson Hill. G. W. Cortez et al., of Robinson's, owners.

Last Chance Mine (Quartz).—It is in the southern suburbs of Angels, on the Utica-Stickle vein. A three-compartment shaft was sunk 83′ in 1895, when the influx of water became too great to handle with a windlass. Drifts and cross-cuts were run at 50′ from the surface, for the purpose of learning something of the extent of the shoot. Some very rich quartz was found, which carried also sulphurets of iron and lead. The appearance of the rock is very similar to that of the Utica-Stickle Mine, but the shoot is entirely distinct and independent of the latter, though in the same mineral zone or vein. Idle. G. C. Tryon & Sons, of Angels, owners.

Laswell Mine (Drift).—It is on Balaklava Hill, 3 miles S. of Vallecito, and on the Cataract channel. Laswell Bros., of Vallecito, owners.

Legal Tender Mine (Quartz).—It is on Indian Creek, 5 miles N. of Murphy. A cross-cut tunnel has been run 120′ to the vein, and a shaft sunk 45′ on it. The quartz is good grade. George S. Taylor et al., of Murphy, owners.

Leonard (Wiley) Mine (Quartz).—See our Xth Report, p. 151. It is 2 miles N. of San Andreas, and on the north side of Murray Creek. It is an old prospect, reopened and equipped within the past two years. A cross-cut tunnel has been driven 400′ to the vein, and a complete 10-stamp mill was built at the mouth of the tunnel. After being in operation two months all work was suspended. The mill has been moved to the Fellowcraft Mine at San Andreas. W. S. Weymouth, of Drytown, Amador County, owner.

Lewis Mine (Quartz).—See Gold Hill.

Lewis Mine (Drift).—It is 1½ miles N. of Sheepranch. Worked by ground-sluicing. J. C. Lewis et al., of Mountain Ranch, owners.

Lightner Mine (Quartz).—It is in the northern suburbs of Angels. The surface ground (ore, and tailings from an old mill) was being worked in the Maltman mill, near Altaville. Joseph Eastman, of San Francisco, owner.

Linderaxa Mine (Quartz).—It is 1½ miles N.E. of Mokelumne Hill, in the Mokelumne Hill River Cañon. A tunnel, over 400′ in length, exposes the vein, 1′ to 10′ wide, in diorite, which, near the vein, is splintered and often altered to chlorite schist. A 10-stamp mill has been erected 200′ below the tunnel, the quartz being sent down in a covered chute. Prospecting work was done, and the mine closed in the fall of 1895. Linderaxa Mining Co., of Berkeley, owner.

Lindsey (*San Antonio, Black Gorge*) *Mine* (Quartz).—See our Xth and XIth Reports, pp. 151 and 174. It is 1½ miles W. of Angels. The developments consist of a 65′ incline and a 100′ vertical shaft. B. R. Prince et al., of Altaville, owners.

Lockwood Mine (Quartz).—See our VIIIth Report, p. 138. It is 2 miles E. of West Point, in granite. The shaft is 280′ deep, and is equipped with steam-hoist, air-compressor, etc. A very rich shoot of ore was found in sinking. Two veins were exposed in the shaft; one 14″ wide and the other smaller. The quartz was heavily sulphuretted, and showed considerable gold. Eight men are employed. Russell Mining and Milling Co., of San Francisco, owner; H. Calbick, of West Point, superintendent.

Lone Star (*Reed & Hillary*) *Mine* (Quartz).—See our Xth and XIIth Reports, pp. 152 and 94. It is 2½ miles N.W. of West Point. Idle. M. Hurley & Co., of San Francisco, owners.

Lone Star Mine (Drift).—It is 1½ miles N.E. of Mokelumne Hill, on the Old Woman's Gulch channel. A 10-stamp mill has been built on the property since our last Report. Idle. H. B. Havens & Co., of Mokelumne Hill, owners.

Long Gulch Mine (Quartz).—It is 2½ miles S. of Angels, on Long Gulch. It has many superficial cuts, but no systematic development. Thomas Hardy, of Angels, owner.

Lucky Tom Mine (Drift).—It is 14 miles E. of San Andreas. The tunnel is in 200′, and still being driven. There is a 5-stamp mill on the mine, which was idle in consequence of too little ground having been blocked out. Its capacity is 60 tons a day. Twelve men are employed. T. Martin et al., of Mountain Ranch, owners; W. H. Clarey, of Sheepranch, superintendent.

Macchiavello Mine (Drift).—It is 5 miles N.W. of San Andreas. Idle. A. Macchiavello, of North Branch, owner.

Madison (*Lane & Tulloch, Matson*) *Mine* (Quartz).—It is in the southwestern suburbs of Angels. See our Xth and XIIth Reports, pp. 151 and 95. The inclined shaft has reached a depth of 1,350′. Levels are opened at every 100′, the longest being at the 900′, where a drift extends 1,000′ N. toward the Gold Cliff, and also from the shaft 500′ S. Other levels are each several hundred feet long. The drifts are all of large size, 6′ to 20′ wide and 10′ to 20′ high. There are only a few places which might properly be termed stopes. The rock milled from this mine for several years past has been chloritic and talcose schists (altered diabase), containing, between the laminations of the schist, thin layers of quartz and calcite, together with about 4% auriferous pyrite. This zone is from 6′ to over 20′ wide, and lies under a massive quartz vein which runs entirely through the claim and beyond its limits. The quartz is from 4′ to over 60′ wide, as proven by numerous cross-cuts on the many levels. It is very low grade, and only a small amount of it has been milled. The pay zone in some places is in direct contact with this massive vein, and is as frequently found at some distance from it. Small banded veins, from a few inches to 2′, occur in various parts of the mine, lying on a smooth, well-defined wall, and usually on the foot-wall side of the pay zone; these veins are higher grade than the average rock of the zone. Portions of the massive vein are granulated and crumbling, like coarse salt, due to pressure and movement subsequent to the formation of the vein. On the hanging-wall side of this vein a gouge is found, some places a foot, and in others several feet wide. It is filled with soft, putty-like substance, with fragments of quartz and diabase. No exploration has been carried into the diabase beyond this gouge. The surface plant consists of water-power hoist and air-compressor and a 40-stamp mill. Air drills are used almost exclusively in this mine. Thirty-eight men are employed. Hayward, Lane, et al., of Angels, owners.

Maloney Mine (Quartz).—It is near Hawkeye, 4 miles N.W. of Angels. A shaft, 65′ deep, August 1, 1896, is being sunk on the vein. Eight men are employed. Philip Deidesheimer, of San Francisco, owner.

Maltman Mine (Quartz).—It is midway between Altaville and Angels. Idle. James Maltman, of Angels, owner.

Marble Springs Mine (Quartz).—See Big Spring.

Marshall Mine (Quartz).—See Cushing.

Matson Mine (Quartz).—See Madison.

Maxwell Mine (Quartz).—It is 2 miles W. of Angels, and has a 60′ incline and a cross-cut tunnel, 260′ long, which is thought to be within 60′ of the vein. James Maxwell et al., of Angels, owners.

Mayflower (*Banner*) *Mine* (Quartz).—See our XIIth Report, p. 95. It is 1 mile W. of Murphy. After being actively developed in 1893 for a time, work was suspended. W. S. Edwards, of Calico, San Bernardino County, owner.

McCreight, Hardy, and Tryon Mine (Quartz).—See our VIIIth Report, p. 129. It is 3 miles S. of Angels on the north slope of Chaparral Hill, and is reputed to have produced a large amount of gold. The main tunnel is 700′ long on the vein. Hayward, Lane & Hardy, of Angels, owners.

McKinley Mine (Quartz).—It is 2½ miles S. of Angels, at the lower end of Albany Flat. Ownership in dispute. Claimed by John Meyers, of Angels.

McQuig (*Dodson & McQuig*) *Mine* (Quartz).—See our XIIth Report, p. 92. It is 2 miles W. of Murphy, and has three tunnels, 120′, 370′, and 193′ long, respectively. All are run on the crevice. The vein averages 1′ in width. Three separate shoots are exposed in the longest tunnel, and some stoping has been done. This is the only mine observed in this district where the quartz is not accompanied by a dike. The quartz is blue, has a banded structure, and carries auriferous pyrite, galena, and chalcopyrite, and free gold. Four men are employed. John McQuig, of Murphy, owner.

McSorley Mine (Drift and Hydraulic).—See Green Mountain.

McSorley Mine (Drift).—It is 5 miles N.W. of San Andreas. A shaft is being sunk through the volcanic cap to reach the channel. Two men are employed. J. M. McSorley et al., of Mokelumne Hill, owners.

Meinecke & Sanguinette (*Balaklava*) *Mine* (Drift and Hydraulic).—It is 2½ miles S. of Vallecito, on Balaklava Hill. Idle. Meinecke & Sanguinette, of Vallecito, owners.

Melones Consolidated Mines (Quartz).—They are on Carson Hill, and comprise the following mines: *Enterprise*, 457′; *Keystone* (*French and Wood*), 201′ (see our Xth Report, p. 57); *Melones*, 1,276′ (see our XIIth

Report, p. 95); *Mineral Mountain*, 2,563′; *Reserve*, 980′ (see our Xth Report, p. 58); and *Stanislaus*, 1,000′ (see our Xth Report, p. 57), together with three mill sites, containing 28 acres. The mines extend from near the Stanislaus River to the summit of Carson Hill. The Melones and Reserve mines have a large amount of development, and all the claims have had considerable work done on them. A cross-cut tunnel has been driven 260′ to the vein on the Stanislaus Mine, and drifting north was commenced in the latter part of 1895. Melones Cons. Gold and Silver Mining Co., of San Francisco, owner.

Merrimac Mine (Drift).—It is 4½ miles N.W. of San Andreas. A shaft is being sunk to reach bedrock. Phœnix Milling Co., of Sacramento, owner; John Shaw, of North Branch, superintendent.

Merrimac Mine (Quartz).—See Allison.

Meteor Mine (Quartz).—It is 8 miles E. of San Andreas, and is a new prospect with a 70′ shaft and a 150′ tunnel on the vein, which is about 1′ wide. A 2-stamp mill has been built for prospecting. Two men are employed. W. B. Swank, of Mountain Ranch, owner.

Mineral King Mine (Quartz).—It is 12 miles N.E. of West Point, and is a prospect containing both gold and silver. J. Gouldson et al., of West Point, owners.

Mineral Mountain Mine (Quartz).—See Melones Consolidated.

Montana Mine (Quartz).—It is a prospect 2 miles W. of Mokelumne Hill, and has a 60′ shaft. J. W. Provard, of East Oakland, owner.

Morgan Mine (Quartz).—See our IXth and Xth Reports, pp. 37 and 57. It is 4 miles S. of Angels, on the summit of Carson Hill. The croppings of the vein consist of a great vein of quartz, nearly 100′ wide in places, and carry quite a large percentage of sulphurets. The vein has a ribbon-like structure, though not like the bluish banded quartz of smaller veins, and lies in nearly parallel waving bands, having a granular appearance. Its structure is entirely unlike any other massive quartz croppings observed in this section. Usually these great masses are flinty, milky, or glassy, containing little pyrites or gold. A 900′ cross-cut tunnel, with two branches, has been run into the mountain, from which a 100′ winze has been sunk and an upraise made to connect with the surface. In this cross-cut the great vein is seen to be 65′ wide, having the same banded structure as observed on the surface. The mine is still idle, as it has been for years. Estate of James G. Fair, and William Irvine, owners.

Morning Star Mine (Quartz).—It is 8 miles N.E. of Milton, on a tributary of Slate Creek. The croppings are quite prominent and prospect well. The quartz occurs in a broad dike of light gray rock, much decayed and stained by iron oxides near the surface. The quartz is found as a reticulated mass without any definite arrangement, though in a general way having a parallelism with the walls. The larger amount of the quartz occurs on the east—presumably hanging-wall side—the vein standing nearly perpendicularly. A shaft was sunk 40′, and at that depth encountered a slip; the vein was cut off and found resting on a floor of black slate. A cross-cut tunnel was run 120′ into the hill and encountered a second dike vein. A winze on this vein found it also faulted by the same slip. Search for it beyond the slip had been made, but the vein had not yet been rediscovered. Four men are employed. Robert Donner and Thomas Dolan, of Milton, owners.

Moser Mine (Quartz).—See Roanoke.

Mount Nebo Mine (Quartz).—It is on Red Hill, ½ mile W. of Vallecito. The shaft has reached a depth of 50′. Two men are employed. John and William Moyle, of Vallecito, owners.

Mount Ophir Mine (Quartz).—It is on Tunnel Ridge, 4½ miles S.W. of Mokelumne Hill, and is an old claim being reopened. The property also includes the *Woodstock* claim, which joins it. The shaft was 100′ deep. A shaft is being sunk on the Woodstock. Five men are employed. Fischer, Holmes & Perry, Columbia Bank, of San Francisco, owners; W. P. Ball, of Mokelumne Hill, superintendent.

Mountain King Mine (Quartz).—It is 3 miles N.W. of Copperopolis. An incline has been sunk 100′, and other superficial work done on a vein in a dike. W. Wamble, of Copperopolis, owner.

Moyle Mine (Drift).—It is 2 miles S. of Vallecito, on the Cataract channel. Ten men are employed. William Moyle, of Vallecito, owner.

Muller Mine (Quartz).—See Casnelli.

Murphy District.—The region for several miles east, west, and north of Murphy has for years been celebrated as one producing gold quartz of high grade. The placer mines about the town were rich and laid the foundation for several fortunes. There have been a few successes and many failures in the quartz mines of the district. The failures have been due to many causes; among them were the installation of machinery unsuited to the treatment of the ore; machinery of insufficient capacity to handle water; incomplete amalgamation in the mills, as proven by the assay value of several piles of tailings, and unskilled management. The veins of the district usually occur in mica schist, quartzite phthanite, or limestone of the Calaveras formation. The shoots are usually short; the veins irregular in size, and often accompanied by dikes. In some of the mines the dike is also gold-bearing, as at the Esmeralda and Golden Queen. The quartz is usually high-grade—$10 to $100 per ton. It is not necessary that each mine should have a mill to insure success. Two or three good custom mills, honestly and properly run, with all the modern devices to save sulphurets, slimes, etc., would be of direct benefit, if the mill charges were not exorbitant. This plan has been adopted in the Julian District, in San Diego County, with success. The quartz in Murphy District is sometimes white, but usually blue or bluish-black, of good grade. Most of the white and blue quartz of massive structure is worthless, and destitute of sulphurets. It emits a fetid odor when broken, and has a glassy, flaky appearance.

Murray Creek Mine (Quartz).—It is 7 miles E. of San Andreas, near Mountain Ranch. Idle. Murray Creek Mining Co., of San Andreas, owner.

Neversweat Mine (Quartz).—It is 1¼ miles N. of Sheepranch. It is a new prospect, with 20′ and 35′ shafts. J. C. Lewis, of Mountain Ranch, owner.

New York Mine (Quartz).—It is 2 miles N.E. of Railroad Flat, and has been idle a long time. It is equipped with steam hoist and rocker mill. The ownership is in dispute.

Nixon Mine (Quartz).—It is 1½ miles N. of West Point, and is a new prospect in granite. It has an incline 60′ deep. Two men are employed. Robert Nixon, of West Point, owner.

Norfolk Mine (Drift).—See our XIIth Report, p. 96. It is ½ mile E. of Murphy. The channel was found much disturbed, and unsatisfactory results generally are said to have closed the mine. John H. Heard, of Murphy, agent.

North Hill Mine (Hydraulic).—See Boston.

North Star Mine (Quartz).—It is 2 miles E. of West Point, and has a 30′ shaft on a vein in granite. M. D. Wickham, of West Point, owner.

Old Calaveras Mine (Quartz).—It is on the Sheepranch road, 5 miles N. of Murphy. A large amount of work was done on the mine years ago. The principal shafts are 100′ and 600′ deep. Dismantled. In the summer of 1895 a cyanide plant was built to leach the tailings, a large quantity of which have been impounded below the old mill. F. J. Horswill, of Valley Spring, owner.

Oro y Plata (Willard) Mine (Quartz).—See our VIth Report (Part II), pp. 35–42. It is ½ mile N. of Murphy, in limestone. Idle. John H. Heard, of Murphy, agent.

Our Flag Mine (Quartz).—It is 1 mile E. of Robinson's, on the divide, between Coyote Creek and the Stanislaus River. It is a pocket mine, from which considerable gold has been taken. Two men are employed. McArdle Bros., of Robinson's, owners.

Particelli Mine (Quartz).—It is a prospect, 3 miles W. of Mokelumne Hill. Idle. — Particelli, of Mokelumne Hill, owner.

Petticoat Mine (Quartz).—It is at Railroad Flat, and was worked years ago and then abandoned. Active steps are being taken to reopen it. W. H. Clarey, of Stockton, owner.

Pierano Mine (Quartz).—See Santa Ana.

Pierce (Deer Lodge) Mine (Quartz).—It is 7 miles E. of Murphy, on the slope of Stanislaus Cañon. The vein is small, and contains some high-grade quartz. Opened by several tunnels, 100′ to 150′ in length, and one shaft 80′ deep. Perry Condit, of Murphy, owner.

Pineapple Mine (Quartz).—It is a prospect, N.E. of Mokelumne Hill, and resembles the Esperanza. J. Harris, of Mokelumne Hill, owner.

Pine Log Mine (Quartz).—See our XIth Report, p. 168. It is 2¾ miles N.W. of Copperopolis. See Royal Consolidated.

Pioneer Chief Mine (Quartz).—See our Xth Report, p. 63. It is 1¼ miles W. of San Andreas, on the west or foot-wall fissure of the Mother Lode. The vein is found at contact of black slate and diabase, the latter on the foot-wall. On the dumps may be seen a large amount of crystalline limestone. Its stratigraphical relation to other rocks could not be determined, as the mine is inaccessible. The vein rock consists mostly of calcite and a little quartz, and a small percentage of sulphurets. B. K. Thorn, of San Andreas, owner.

Plymouth Rock Mine (Quartz).—See our VIIIth Report, p. 147. It is 6 miles N. of Milton, near Jenny Lind. The mine is developed by a large open cut and a tunnel on the vein, 200′ long, with several cross-cuts and chambers. These workings expose a broad zone of altered diabase, with the infiltration of quartz and auriferous pyrite. The latter occurs in streaks and bunches up to 30%. These highly mineralized portions are loosely coherent, and crumble easily. Between the heavily sulphuretted portions of the ore-shoot the rock contains disseminated pyrite, ranging from 1% to 10%. The oxidized ores near the surface contain free gold, but it is essentially a concentrating proposition, and to this fact is no doubt due the failure made when the mine was worked several years ago. The mine is being reopened and a new shaft sunk 100′, where a station has been made and cross-cuts and drifts run.

The north drift is 62′ in length. The Huntington mill has been rebuilt and a 12′x 50′ chlorination furnace erected. Twenty-two men are employed. Lane, Smith et al., of Angels, owners; T. T. Lane, superintendent.

Point Rock Mine (Quartz).—It is on the south side of Carson Hill. G. W. Grayson, of San Francisco, owner.

Poorman Mine (Quartz).— It is 1½ miles E. of Glencoe. After several years of idleness it is being reopened. Seventeen men are employed. Lawson & Co., of San Francisco, owners; C. L. Morrison, of Glencoe, superintendent.

Poverty Mine (Quartz).—It is on the Tower ranch, in Salt Spring Valley, 8 miles E. of Milton. The vein occurs in a dike, on which an incline has been sunk 60′, when a fault was encountered. They were endeavoring to find the vein. John Howard, of Milton, owner.

Prince Mines (Quartz).—They are "prospects," ¼ mile N. of Altaville, with only superficial development. B. R. Prince, of Altaville, owner.

Pure Quill Mine (Quartz).—It is ¾ mile W. of Angels, and is a new mine; a vertical shaft has reached 60′ in depth. Since our inspection *it is reported* that very rich quartz has been found at a deeper level. Idle. S. F. Godbe & Co., of New York, owners; James Dedrick, of Angels, manager.

Putnam Mine (Drift).—It is on the western slope of Central Hill, 4 miles W. of San Andreas. Ira H. Reed, of San Andreas, owner.

Quaker City Mine (Quartz).—See our VIIIth and Xth Reports, pp. 144 and 65. It is 4 miles S.W. of Mokelumne Hill. It is idle, but a man is employed constantly in keeping the mine in good condition and running the pumps. A. Knell, of Mokelumne Hill, agent.

Quartz Glen (*Foote & Thompson*) *Mine* (Quartz).—It is near Rich Gulch, 6 miles N.E. of Mokelumne Hill. It was opened years ago by a shaft 120′ deep and a 1,000′ tunnel on the vein, but 240′ below the bottom of the shaft. A second tunnel, 275′ below the other, is 600′ long. In the latter the ore-shoot is 120′ long and pitches north. The strike of the vein is N. and S., and dips 70° W. On the opposite side of Alabama Gulch a third tunnel has been run 450′ north on the vein, all in quartz. A 20-stamp mill stands on the property. Forty men are employed. Roanoke Mining Co., of Mokelumne Hill, owner; W. T. Harris, of Rich Gulch, superintendent.

Rathgeb-Union Mine (Quartz).—See our VIIIth and Xth Reports, pp. 147 and 63. It is 3 miles S. of San Andreas. Idle. Wm. Holland, of San Andreas, owner.

Reed & Hillary Mine (Quartz).—See Lone Star.

Reef Rock Mine (Quartz).—It is 3 miles N.E. of Angels. The vein is large and crops out boldly in diabase for several hundred feet. The developments consist of a 125′ tunnel, with cross-cuts, and a 35′ upraise to the surface. There are also several surface cuts 10′ to 15′ deep. In places the quartz contains considerable iron sulphurets. Idle. Geo. S. Taylor, of Murphy, owner.

Relief Mine (Quartz).—It is ½ mile S. of Angels, and has been worked for pockets in the amphibolite schist. A large quartz vein running through the claim has little or no development. Naylor Williams et al., of Angels, owners.

Reserve Mine (Quartz).—It is on the summit of Carson Hill. See Melones Consolidated.

Right and Left Bower Mines (Quartz).—They are 6 miles N. of Murphy, on a ridge between San Antonio and Indian creeks. The prospect is opened by tunnels. Two men are employed. Geo. McCullom et al., of Murphy, owners.

Rising Sun Mine (Quartz).—It is 1 mile E. of Robinson's, between Coyote Creek and Stanislaus River, and is a pocket mine on which there are several shafts and surface cuts. Besides gold in pockets, this vein produces a high-grade sulphuret ore, which is shipped. Two men are employed. McArdle Bros., of Robinson's, owners.

Riverside Mine (Quartz).—It is 2½ miles W. of West Point. See our XIIth Report, p. 96. T. J. Severns, of West Point, agent.

Roanoke (*Moser*) *Mine* (Quartz).—See our XIIth Report, p. 95. It is 1 mile S.E. of Mokelumne Hill, and includes the Lamphyre, on the same vein. Since our last Report several hundred feet of drifts have been run and a large, well-appointed station made at the intersection of the adit level with the vein. An upraise extends 140′ to the surface, through which a pipe passes and supplies water, under 200′ pressure, to a Donnelly wheel located at the station. A geared hoist has been placed in the station and a shaft sunk, which had reached a depth of 100′ below the station level. The Roanoke vein dips W. at the surface, but as depth is attained it nears the vertical, and in the bottom of the shaft it dips slightly E. The Lamphyre Mine is an old claim, and is to be reopened. Its old 12-stamp mill is to be moved to the site of the Roanoke 8-stamp, water-power mill, making a 20-stamp mill, and a tramway will be laid from the new shaft to the mill. Fourteen men are employed. Roanoke Mining Co., of Stockton, owner; W. T. Harris, of Mokelumne Hill, superintendent.

Romarggi Mine (Quartz).—See Gold Reserve Consolidated.

Rose Hill (*Rodesina*) *Mine* (Quartz).—See our XIth Report, p. 176. It is 1 mile S.W. from El Dorado (Mountain Ranch Postoffice). Idle. Rodesino Estate, of Mountain Ranch, owner.

Rose Rock Mine (Quartz).—It is 3½ miles N. of Murphy, between San Domingo and Indian creeks. The vein varies from a few inches to 4′ in width, averaging about 1½′. Two tunnels have been run on the vein, the lower one being 240′ long. At 60′ from the face of this tunnel a winze has been sunk 30′, giving a total depth of 175′ from the surface. The fissure cuts mica schists and is accompanied by a dike, and is very irregular. The quartz is partly white and partly dark blue, characteristic of this region. It contains iron, lead, and zinc sulphurets. Four men are employed. Cunliffe & Driver, of Murphy, owners.

Royal Consolidated Mines (Quartz).—See our XIth Report, p. 168. The property comprises the *Ant Hill*, *Goodenough*, *Pine Log*, and *Royal Mines*. This group is located in Salt Spring Valley, about 2½ miles N.W. of Copperopolis. The Pine Log Mine has considerable development, the main incline being 115′ deep; besides, there is a large amount of superficial work. The upper portion of the vein has been stoped. This mine was idle, and the only active operations were in the Royal and Goodenough mines, which are worked as one mine, the main incline being sunk on the dividing line. The incline is 520′, and levels run at every 100′. The ore-shoots occur as a series of swells or lenses, large and small, in a dike which has been injected at or near the contact of the black slates of the Mariposa formation and massive diabase, which lies east on the hanging-wall side. The quartz lies in parallel sheets or veins, and as reticulated masses replacing the dike, and lying mostly along the hanging-wall side of the dike. The dike rock is often found to have become highly silicious, while still preserving much of its normal fine-granular appearance. It frequently contains gold and auriferous pyrite. The average thickness of the vein that is being stoped is 5′ or 6′. The vein is 4″ at the shaft, at the 400′ level. In the south drift it widens to 4′ in a distance of 10′, and a few feet above, in a stope, is 18′ to 20′ thick. This stope had a superficial area on the hanging-wall of 3,000 sq. ft., the wall being supported by a few well-placed posts (stulls), 16″ in diameter. There is no better standing ground in the State. The repeated pinching of this vein may be looked upon as an advantage in one way, as it leaves frequent substantial pillars to support the roof, consequently rendering an elaborate system of timbering or filling of stopes unnecessary. In a few places the vein has been found to split, forming two distinct shoots separated by barren dike rock. This, however, is not a common feature. Near the surface the vein dips 30° E., but is much flatter in depth, being about 20° on the 400′ level, and from 5° to 15° on the 500′ level. At the 500′ level a fault has cut the vein abruptly, the fractured end of the vein abutting solidly against a vein of quartz about 12″ thick, which dips 60° W. Immediately back of it is massive granular diabase. As the shaft had only been carried below this level to a sufficient depth for a sump, it is impossible to say what may be exposed by further developments. The steam 10-stamp mill is situated about ¼ mile from the hoisting works, and has two 6′ Frue vanners. The concentrates are shipped. A canvas plant formerly in operation has been abandoned. It is the intention of the management to move the mill to a point nearer the mine, and to add 10 stamps. There is still a large amount of milling rock in the Royal and Goodenough mines, while the remaining claims are almost wholly undeveloped. Fifty men are employed. Royal Consolidated Mining Co., owner; D. Jutton, of Copperopolis, superintendent.

Safe Deposit Mine (Quartz).—See our XIth Report, p. 172. It is at the upper end of Smith's Flat. Charles D. Smyth, of Angels, owner.

Salt Spring Valley Mines.—A gold belt extends through Salt Spring Valley from the vicinity of Copperopolis, in a northwesterly direction, as far as the neighborhood of Valley Springs, a distance of 15 miles or more. The valley lies between Gopher Ridge on the west and Bear Mountain on the east. Both of these elevated ridges are made up largely of diabase, diabase conglomerate, and amphibolite schist. The formation of the valley consists of foliated black slate of the Mariposa formation, diabase, amphibolite schist (altered diabase), and serpentine. The latter occurs in the form of elongated lenses along the east side of the valley. In the serpentine, or at contact with it and other rocks, have been found small quantities of rich copper ores and some small deposits of chrome iron. Through the slates and schists of the valley have been intruded numerous dikes of peculiar character. They are usually finely granular, light gray, with many scales of a light green color. They weather brown on exposure, and are sometimes found much decayed. They occur independently, and usually strike parallel with the inclosing formation. The gold-bearing quartz is associated with these dikes, the quartz replacing a greater or less portion of the dike rock itself. In some places silica has almost entirely replaced the dike rock, and in others, little or no vein quartz is found. The veins range from a few inches to 20′, and the ore-shoots are long. The veins mostly dip E., but in some cases dip W. (see Dean Mine), and in others the vein is perpendicular (see Morning Star Mine). Throughout the entire length of this gold belt the work in depth, thus far done on the mines, has shown the veins to be faulted. It is probable that when the conditions which govern these faults are better understood, by reason of more extensive development, they will be considered no particular detriment to successful mining operations. Observations thus far made lead to the belief that the faults are of the reverse type, known as thrusts.

San Antonio Mine (Quartz).—See Lindsey.

Santa Ana (*Pierano*) *Mine* (Quartz).—It is 2 miles S. of Angels, on Albany Flat. A new shaft has reached a depth of 100′. The vein in diabase is 2′ wide. Twelve men are employed. H. C. Woodrow, of Angels, owner.

Santa Cruz Mine (Quartz).—See Calaveras Consolidated.

Shaw Mine (Drift).—It is on Golden Gate Ridge, ½ mile W. of North Branch. Idle. Phœnix Milling Co., of Sacramento, owner; John Shaw, of North Branch, superintendent.

Shaw Mine (Quartz).—It is 2½ miles N. of Murphy, and is opened by two cross-cut tunnels. No machinery. The owners are developing the mine. Two men are employed. Alfred Shaw et al., of Murphy, owners.

Sheepranch Mine (Quartz).—See our VIIth and XIth Reports, pp. 131 and 175. It is at Sheepranch, 12 miles N.E. of San Andreas. Closed down in 1894, and has since remained idle. The old workings, 1,200′ deep, are flooded to within 300′ of the surface—the level of a tunnel driven in from O'Neal's Creek, though not connected with the workings; but it is apparent that this tunnel has drained the mine to this level. J. B. Haggin et al., of New York, owners; W. H. Cleary, of Sheepranch, superintendent.

Shenandoah Mine (Quartz).—See our XIth and XIIth Reports, pp. 176 and 96. It is 2½ miles N.W. of El Dorado, and on the north side of Jesus Maria Creek. It is being prospected. Six men are employed. Shenandoah Mining Co., of Oakland, owner; William Nixon, of Mountain Ranch, superintendent.

Shephard Mine (Drift).—See Banner Blue Gravel.

Sheridan Mine (Quartz).—See our XIIth Report, p. 97. It is ¼ mile below Robinson's. The main adit is 100′ long. Thomas Richards, of Sonora, Tuolumne County, owner.

Silver Mountain Mine (Quartz).—It is 5 miles S.E. of West Point, between the South and Licking forks of the Mokelumne River. The rock mass upon which this claim is located is a trachytic tuff, and apparently a remnant of the volcanic capping of the gravel channels found in the vicinity. It is claimed by the owners that this material contains both gold and silver. C. E. Congdon et al., of Railroad Flat, owners.

Single Standard Mine (Quartz).—It is 2 miles W. of Murphy, and is a small vein opened by cuts and shafts, 10′ to 55′ deep. Several pockets have been found in these surface workings. James McQuigg, of Murphy, owner.

Slate Creek Mine (Quartz).—It is 4 miles S. of Valley Springs. It has a 2′ vein of gold-bearing quartz, which is being developed by shaft and tunnel. Four men are employed. Chieland & Caldwell, of Valley Springs, owners.

Sloane & Rudorff Mine (Drift).—It is 2½ miles S. of Vallecito. Worked during winter and spring months. Sloane & Rudorff, of Vallecito, owners.

Smyth Mine (Quartz).—It is on Red Hill, ¼ mile W. of Vallecito, and has a tunnel 300′ long. Chas. D. Smyth, of Angels, owner.

Smyth Mine (Quartz).—See Brown, Smyth, and Ryland.

South Carolina Mine (Quartz).—It is on the southern slope of Carson Hill, 5 miles S. of Angels. A great mass of ankerite and mariposite, upward of 100′ wide, courses through the property, and in it are found great vein-like sheets of quartz. The developments consist of several tunnels, with cross-cuts. A new tunnel has been commenced near the base of the mountain, which is being driven to reach a point under the shoots exposed in workings higher up the mountain. Ten men are employed.

South Paloma Mine (Quartz).—It is the first south extension of the Gwin Mine. A shaft, 165′ deep, has been sunk, and intersected at 65′ depth by a tunnel. Drifting N. and S. on a small but gold-bearing vein has been commenced on the 150′ level. The walls are black slate, similar to the Gwin, and assumed to be on the same vein as the latter. The strike at the shaft is N. 17° W. Arrangements have been made to sink the shaft to 800′ in depth with a steam hoist. Twelve men are employed. South Paloma Mining Co., of San Francisco, owner; Mark B. Kerr, of Gwinmine, superintendent.

Sparks Mine (Drift).—It is 4 miles S.E. of Mokelumne Hill, on the Old Woman's Gulch channel. J. B. Sparks, of Campo Seco, owner.

Spring Gulch Mine (Placer).—See our XIIth Report, p. 97. It is 3 miles N. of San Andreas. Idle. J. S. White & Co., of San Andreas, owners.

Spring Gulch Mine (Quartz).—It is a prospect near Chaparral Hill, 3 miles S. of Angels. Thomas Smith et al., of Angels, owners.

Stanislaus Mine (Quartz).—See Melones Consolidated.

Star of India (*Curtis*) *Mines* (Quartz).—See our XIIth Report, p. 97. They are 2 miles W. of Angels, and on the west side of Smith's Flat. The group comprises three claims, in one of which a tunnel has been driven 360′, cutting a mass of quartz 40′ wide. At other points two shafts have been sunk 50′ on a vein 5′ to 6′ wide. Idle. Joseph F. Curtis, of Angels, owner.

Stars and Stripes Mine (Quartz).—It is on the Williams ranch, 2½ miles N.E. of Milton. A shaft was sunk years ago for copper. The rock also contains gold. N. Owens, of Milton, owner.

Starlight Mine (Quartz).—It is 8 miles E. of San Andreas. A shaft has been sunk 145′ on a 3′ vein of gold-bearing quartz. It has a steam hoist and a 5-stamp mill. Idle in 1895, pending the settlement of some disagreement between the owner and parties who had bonded the mine. W. B. Swank, of Mountain Ranch, owner.

Stickle Mine (Quartz).—See Utica-Stickle.

Stonewall Mine (Quartz).—It is 2½ miles S.W. of Murphy, and is a small vein, accompanied by a dike in mica schist. It has been prospected for a thousand feet by superficial workings, the deepest of which is a 55′ shaft. A tunnel has been run 360′ on the crevice, to reach a rich shoot. Two men are employed. Geo. Taylor, of Murphy, owner.

Stony Gulch Mine (Placer).—It is 3½ miles N.W. of Milton. Worked during winter months. U. G. Findley and M. L. Hunt, of Milton, owners.

Suffolk Mine (Quartz).—See Brown, Smyth, and Ryland.

Suffolk Mine (Quartz).—See our XIIth Report, p. 97. It is 4½ miles S.E. of Angels, and has only superficial development. Isaac Copeland, of Vallecito, owner.

Thorp Mine (Quartz).—See our Xth Report, p. 63. It is 5 miles S. of San Andreas, near Fourth Crossing P. O., and is an old mine being rehabilitated. A new inclined shaft has been sunk 500′ on a 55° angle, and furnished with a steam hoist. At the bottom a cross-cut has been run 60′ W., and drifts 40′ S. and 35′ N. The vein formation is 20′ wide. A large tank has been built at the 300′ station to take up surface water. The water is raised from the bottom by a Cornish pump. Eighteen men are employed. Thorp Mining Co., of San Francisco, owner; L. Allegewahr, of Fourth Crossing, superintendent.

Tilford Mine (Quartz).—It is a prospect on the Tilford ranch, 7 miles N.E. of Milton. A small cut has been made in a large quartz cropping, which prospects in gold. — Tilford, of Milton, owner.

Total Wreck Mine (Quartz).—It is 1 mile W. of Murphy. Idle. Colin Cambell, of Murphy, owner.

Treat Mine (Hydraulic).—It is ½ mile N.W. of Sheepranch (Cave City). Worked extensively many years ago. The tailings are now being rewashed. Geo. Treat, of San Andreas, owner.

Tripp Mine (Quartz).—See Garner Consolidated.

Tryon Mine (Quartz).—It is ¼ mile S. of Angels, adjoining the Last Chance on the south. A 226′ tunnel has been driven on the vein. C. W. Tryon, of Angels, owner.

Tulloch Mine (Quartz).—See our XIIth Report, p. 98. It is 2½ miles S. of Angels, on Albany Flat. The shaft is 150′ deep. Considerable development was done in 1895, and a new hoisting plant built, but the property is now idle. Louis Tulloch, of Angels, owner.

Turner Mine (Quartz).—See Angel's Camp.

Union Shaft Mine (Drift).—It is on Central Hill, 4 miles W. of San Andreas. Ira H. Reed, of San Andreas, owner.

Uno Mine (Quartz).—See Empire Consolidated.

Uptograph (*Buckminster*) *Mine* (Drift).—See our XIIth Report, p. 99. It is at Douglas Flat, on the Central Hill channel. Was worked for a while in 1893 by an Eastern company. The mine was then transferred to the workmen in settlement of their claims, and under their management it is reported to be paying handsomely. Five men are employed. John Black et al., of Douglas Flat, owners.

Utica-Stickle Mine (Quartz).—See our VIth (Part II), VIIIth, Xth, and XIIth Reports, pp. 28, 122–124, 150, and 98. It is situated in the town of Angels, and comprises two claims operated as a single mine under one management. Since our last Report several long levels and cross-cuts have been made, and a winze has been sunk 200′ below the 1,000′ level, at a point some distance south of the Stickle shaft, making the lowest level 1,200′ in September, 1895. This winze was sunk by means of compressed air, a double reversible hoist of improved pattern having been placed in a station at the 1,000′ level. The winze is inclined, and when timbered will be 5′ x 14′ in the clear, having two compartments. The cross-cuts are all large headings, 15′ to

20′ wide and 12′ to 15′ high, and answer a double purpose: prospecting the mine and supplying a large amount of waste for filling the large stopes. The south shaft of the Utica has been connected by an upraise with the 1,000′ level of the Stickle. The north shaft of the Utica remains at the same depth—560′—it has been for several years. The more extensive opening of this mine only tends to confirm what was said in our last Report concerning the geological structure of the ore-bodies and their relations to the inclosing rocks. One important fact, however, was omitted, for lack of sufficient corroborative evidence, viz.: that the amphibolite schist (altered diabase) which, together with the quartz, forms the pay-shoots of this mine, has been intruded by a peculiar grayish-brown dike of granular texture. It is usually found to contain an intricate network of veinlets of quartz and calcite, and is always highly silicious and generally abundantly impregnated with auriferous pyrite. With a few exceptions this rock is always found accompanying the pay zone, forming a portion of it. Indeed, it appears to form a very large portion of some of the principal shoots, which in places are over 100′ wide. In July, 1895, a fire occurred between the 800′ and 900′ levels of the Stickle Mine. A strong draught through the open workings caused the fire to spread with great rapidity, and, as it soon became evident that no ordinary means would extinguish the flames, the shafts were all tightly bulkheaded and the entire available water-supply (1,200 miner's inches, equivalent to nearly 20,000,000 gals. in twenty-four hours) was turned into the mine. For ninety hours this cataract fell into the workings, the water running down through loosely filled ground, the site of a cave which occurred some years previous. By this means the fire was extinguished. The work of unwatering the great stopes then began. Night and day for eight weeks the skips and pumps (regular and extra) were kept constantly employed. The actual damage by fire was confined to a small stope in which it started, and the damage from water was not nearly as great as had been anticipated. In 1895 three hundred and seventy men were employed. In August, 1896, this mine was revisited, but the superintendent refused all information. Utica Mining Co., of Angels, owner; Theodore Allen, of Angels, superintendent.

Vallecito Consolidated Mines (Drift and Hydraulic).—See our XIIth Report, pp. 99 and 482. This property is at and near the village of Vallecito. Since our last Report, work on the company's ditch has progressed somewhat, and additional property has been acquired for both mining and dumping ground. Vallecito Consolidated Mining Co., of San Francisco, owner; Isaac Copeland, of Vallecito, superintendent.

Vanderbilt Mine (Quartz).—It is 3½ miles S. of Angels, on the south slope of Chaparral Hill. A tunnel has been run 200′ on the vein. Idle. E. K. Stevenot, of Sonoma, owner.

Washington Mine (Quartz).—It is 5½ miles N. of Murphy. Idle and dismantled. C. V. Compere, of Murphy, owner.

Washington Ranch Mine (Quartz).—It is 6 miles N. of Murphy. Shaft 200′ deep. Idle. Joseph Latora, of Murphy, owner.

Water Lily Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 141 and 90. It is 1 mile N.E. of West Point. Worked by tributers. M. Porter, of San José, Santa Clara County, owner.

West Point District.—See our XIIth Report, p. 99. There are a great many claims in this district, but not more than half a dozen were in operation in fall of 1895.

Wheelock Mine (Quartz).—It is ½ mile S.E. of Sheepranch. A tunnel and some surface cuts expose a vein 1′ to 6′ wide. The quartz is worked in arrastras.

White Oak Mine (Quartz).—It is at Smith's Flat, 1½ miles W. of Angels. It has a tunnel driven 100′ on a banded quartz vein, which contains gold and auriferous pyrite. The croppings may be traced several hundred feet. Three men are employed. Mercer & Gilman, of Angels, owners.

White Pine Mine (Quartz).—See Yellow Pine.

Whittle Mine (Quartz).—It is 4 miles S. of Angels, near Carson Creek. The shaft is caved and the machinery removed. Solinsky, Reddick, et al., of San Andreas, owners.

Wiley Mine (Quartz).—See Leonard.

Willard Mine (Quartz).—See Oro y Plata.

Williams Mine (Drift).—It is 3 miles S.E. of Mokelumne Hill, on Old Woman's Gulch channel. It is being worked steadily. Four men are employed. John Williams, of Mokelumne Hill, owner.

Woodstock Mine (Quartz).—See Mount Ophir.

Yellow Pine (*White Pine*) *Mine* (Quartz).—It is 3 miles N.E. of Milton. The ore-shoot occurs in altered diabase. Great fissures course through the rocks, and between these the gold and auriferous pyrite have been deposited. Some years ago a corporation built a mill and worked the mine, but unsuccessfully. J. E. Findly and Edward Vancel, of Milton, owners.

Yellowstone Mine (Quartz).—See our XIth Report, p. 173. It is at the upper end of Smith's Flat, and has been idle for a long time. Chas. D. Smyth, of Angels, owner.

Young America Mine (Quartz).—It is 2½ miles N.W. of Murphy, near San Domingo Creek. It has a tunnel 100′ long, which exposes two short shoots of ore, containing 5% of sulphurets. Dora Mining Co., of San Francisco, owner.

Zacatera Mine (Quartz).—It is 3 miles N.E. of West Point, and said to have been successfully operated years ago. The shaft, 600′ deep, is caved. The long cross-cut tunnel is being reopened. The formation is granite. Porteous & Field, of West Point, owners.

MILLS IN CALAVERAS COUNTY.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of Each, in Lbs.	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
					No.	Character.	No.	Capacity.		
Altaville		8	700							
Banner Blue Gravel		4	500	30						
Beatrice		10	850							
Benson		3	800	35						
Birney		5	750	12	2	Tulloch				
Bisbee		5	400	8	1	Tulloch				
Blair Consolidated		10	850							
Blazing Star		5	850	6–7	1	Frue				
Brown, Smyth, and Ryland		10	850							
Calaveras Consolidated		20	850	60						
Carson Creek		40	650	70	8	Tulloch				
Dean		2	200	2						
Donnelan		5	850							
Dora		5	900	12½	1	Woodbury				
Dunlap		2	400	3						
El Encino		10	850	100						
Empire Group		5	850	13						
Esmeralda		10	750							
Esperanza		20	800	50	6	Frue				No data.
Eureka		5	850	10						
Fellowcraft		10	850	(Formerly	on	Leonard.)				
Garner Consolidated		10	850	30						
Gold Cliff		20	800	80	8	Frue				
Gold Hill		10	850	60						
Green Mountain		8	700	120						
Ilex	S. & W.	40	850	80						
Lamphyre		12	700							
Linderaxa		10	1,000	25						
Lockwood		5	800	8	2	Frue				
Lone Star		10	850							
Lone Star		20	850							
Louisa		10	850							
Lucky Tom		5	900	60						
Madison		40	850	140	12 1	Frue U. I. Wks.				

Maltman		4	700							
McCreight	Water	10	650	12						
Meteor		2	420	2						
Old Calaveras	(Idle and gone to decay.)									
Oro y Plata	(Mostly removed.)									
Quartz Glen		20	850	60						
Rathgeb-Union		40	800							
Reserve		40	650							
Roanoke		8	750	20						
Rose Hill		10	800							
Royal		10	850	25	2	Frue				
Russell Reduction and Mining Co.	S. & W.	5	850	7½						
Shaw		5		60						
Sheepranch		20	850	40						
Shenandoah		10	850	20						
Starlight		5	850	12	2	Tulloch				
Stickle		60	850	240	1 24	Tulloch Frue				
Suffolk	Water	5	600	10						
Utica		60	850	240	24	Frue	6	4 tons.		6,500 sq. ft.

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN CALAVERAS COUNTY.

Name of Mill or Mine.	Power.	Number	Character.	Diameter	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
						No.	Character.	No.	Capacity.		
Angels	Water	3	Low		50						
Buena Vista		1	Kendall								
Maltman Reduction Works	Steam	1	Tustin		2½						
New York			Rocker		10						
Plymouth Rock		2	Huntington		25	2	Frue	1			No data.
Quaker City	Water	1	Huntington	6 ft.	15–20						
Russell Reduction and Mining Co.	S. & W.	1	Dodge		7½						
Alameda			Arrastra		1						
Carlton			Arrastra		½						
Dalmazia			Arrastra		1						
Wheelock			Arrastra								

Colusa County.

Though agriculture and stock-raising are the principal industries, a part of the county's revenue is derived from mineral resources. Grain-growing is paramount in that part of the county which lies in the Sacramento Valley, and grazing lands prevail through the mountainous regions of the western part. Its known economic mineral resources consist of gold, mineral waters, petroleum, quicksilver, and sandstone; copper and sulphur are said to have been produced some years ago, but their exploitation was not remunerative.

Clyde Mine (Quartz).—See our XIth Report, p. 183. It is in the Sulphur Creek District, in the S.E. ¼ of Sec. 12, T. 14 N., R. 6 W., at about 3,200′ elevation. It has been worked by a shaft and tunnels, now considerably caved. Good ore is said to have been mined. It is said work is soon to be resumed. Andrew James, of Sulphur Creek, superintendent.

Keely Mine (Quartz).—See our XIth Report, p. 184. It is immediately S.E. of, and adjoins the Clyde Mine; it consists of surface workings only. Idle. J. W. Brim, of Williams, owner.

Manzanita Gold Mining Co.'s Mine (Quartz).—See our XIth Report, p. 194. It is on the north side of Sulphur Creek, in the N.E. ¼ of Sec. 29, T. 14 N., R. 5 W., at about 1,900′ elevation, and consists of three patented claims of 85.85 acres. The ore occurs in thin seams in a broad belt of arenaceous shale, which strikes W. of N. The disseminated ore seams run in all directions, and necessitate mining the intervening country rock. The ore is for the most part sulphurets of iron, and the concentrates are said to carry a high percentage of gold. The workings consist of three large irregular shallow cuts and eight tunnels, 60′ to 130′ long. The plant consists of a Gates crusher, three 5′ Huntington mills, six Victor and two McGlew concentrators, three 5′ amalgamating pans, two 8′ settlers, a 65 H.P. engine and boiler (not in use), and a 35 H.P. Otto gasoline-engine. By using gasoline, from $1 to $2 and the salary of an engineer are said to be saved daily. The mill is run intermittently; 3 miners, 4 millmen, and 3 roustabouts are employed. George W. Northey, of Sulphur Creek, superintendent.

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN COLUSA COUNTY.

Name of Mill or Mine.	Number	Character.	Diameter	Concentrators.	
				No.	Character.
Clyde	1	Huntington	5′		
Manzanita	3	Huntington	5′	6 2	Victor McGlew

Del Norte County.

The principal exports of the county consist of redwood lumber, shingles, boxes, cattle, hogs, and butter. The redwood forest extends along the coast, 5 to 10 miles wide, and will, at the present rate of cutting, supply the markets for many years. A railroad from Smith River

Corners to Crescent City, with several short branches, takes the logs to the mill and the lumber to the wharf. A steamer calls there every week or ten days. Dairying is extensively carried on along the coast; the evergreen hills furnish excellent pasturage for cattle, and are used exclusively for that purpose. The copper deposits at Low Divide, and the extensive gravel beds at French Hill, Haynes, and Big Flat, are of great value. They will no doubt be worked to their utmost capacity in the immediate future and furnish employment to many men.

Bartlett Mine (Quartz).—It lies on the north side of Preston Peak, near the east line of the county. There are four locations on a strong vein. The developments consist of shallow surface cuts, and the ore carries a high percentage of sulphurets of iron and copper. Idle. John Young, of Crescent City, and Green Bartlett, of Waldo, Or., owners.

Baumgarten Mine (Placer).—It is at Big Flat, 25 miles S.E. of Crescent City, and contains 160 acres, at 2,100′ elevation. Worked by ground-sluicing. Water is taken from several small gulches. Charles Baumgarten, of Crescent City, owner.

Big Flat Mine (Hydraulic).—See our XIth and XIIth Reports, pp. 196 and 100. It lies on the ridge between Hurdy Gurdy and Janes creeks, 25 miles S.E. of Crescent City, at 2,160′ altitude. The property contains 240 acres. After lying idle for a number of years the present owners organized a company, and, in 1895, were thoroughly equipping it. The water is taken from Janes Creek, through a 3½′x 2½′ ditch, 6 miles long, with a grade of 12′ per mile. A water-power sawmill, with 50″ saw, furnishes the necessary lumber; 1,300′ of 13″ pipe, two No. 4 giants, and 24″ wide sluice-boxes were on the ground. Janes Creek Milling, Mining, and Irrigating Co., owner; John McLaughlin, of Crescent City, manager.

Burrows and Peak Mine (Placer).—It lies on the Middle Fork of Smith River, 17 miles E. of Gasquet, and contains 60 acres, at 2,550′ altitude. This is a recent location, and a 2′x 2′ ditch, ½ mile long, is now being dug. Burrows & Peak, of Gasquet, owners.

Butler Mine (Placer).—It lies on the French Hill channel, 3 miles S. of Gasquet, and contains 20 acres, at 2,100′ altitude. Water is taken from small gulches by a ditch, and collected in a reservoir. Worked by ground-sluicing. James Butler, of Gasquet, owner.

Casey Mine (Placer).—It is on Myrtle Creek, 7 miles W. of Gasquet, and contains 40 acres, at 820′ altitude. A 2′x 1′ ditch, ¾ mile long, from Myrtle Creek, furnishes water for ground-sluicing. Casey & Moore, of Gasquet, owners.

Cleary Mine (Placer).—It lies on the French Hill channel, 3 miles S. of Gasquet, and contains 20 acres, at 2,160′ altitude. Water for ground-sluicing is collected from several small gulches. Lawrence Cleary, of Gasquet, owner.

Christensen Mine (Hydraulic).—It lies at the mouth of the South Fork of Smith River, 10 miles S.E. of Crescent City, and contains 160 acres, at 300′ altitude. Water is taken from Sheep Pen Gulch by a 2′x 2′ ditch, ½ mile long; 180′ of 7″ hose delivers the water through a 2¼″ nozzle under 60′ pressure. The bank is 20′ high and all gravel. The bedrock is serpentine. The sluices are 20″ wide and are paved with block riffles. Nels. Christensen, of Gasquet, owner.

Coleman Mine (Placer).—It is on Monkey Creek, 15 miles E. of Gasquet, and contains 160 acres, at 2,570′ altitude. Water for ground-sluicing is taken from Temple Gulch through a 2½′x 2′ ditch, 2 miles long. The bank of gravel is 10′ high. Coleman & Haight, of Gasquet, owners.

Cooke Mine (Hydraulic).—It lies on Smith River, 3 miles below Gasquet, and contains 80 acres, at 550′ altitude. Water for ground-sluicing is collected from small creeks by a 3′x 2′ ditch, 2 miles long. A new 3′x 2′ ditch, 2 miles long, was, in 1895, being dug from Cooke's Creek, to work the claim by the hydraulic method. There are 500′ of 11″ pipe, and a No. 3 giant, under 75′ pressure. The sluices are 24″ wide. The serpentine bedrock lies 150′ above the river. George Cooke, of Gasquet, owner.

Coon Flat Mine (Placer).—See our XIth Report, p. 197. It lies on Coon Ridge, 8 miles S. of Gasquet, and contains 100 acres, at 2,100′ altitude. Water is taken from Coon Creek, through a 3′x 2′ ditch, 5 miles long. The bank of gravel is 10′ to 50′ deep, and seems to be a defined channel. It is intended to use a pipe and giant this (1895–96) winter. Now worked by ground-sluicing. Coon Mountain Mining Co., owner; Charles Goodridge, of Crescent City, superintendent.

Crescent City (*Yates*) *Mine* (Beach).—See our XIIth Report, p. 100. It lies on the beach, 3 miles S. of Crescent City, and contains 42 acres. Some years ago an attempt was made to separate the black sand after saving the *free gold*, as it is said to contain $3 of gold per ton. The *modus operandi* was kept secret, but it is supposed that soft iron magnets, excited by electricity, were used. The property is bonded to parties who intend to revive this old process. The plant is still on the ground. The beach sand is worked down 12′, or to water-level. One quarter ounce of platinum per day was saved with the gold. Ed. Yates, of Crescent City, owner.

Estman Mine (Placer).—It is on Siskiyou Fork, 20 miles E. of Gasquet, and contains 40 acres, at 2,760′ altitude. Worked with rockers. Frank Estman et al., of Gasquet, owners.

Frank Mine (Placer).—It lies on the French Hill channel, 3 miles S. of Gasquet, and contains 20 acres, at 2,175′ altitude. Water is collected from small creeks. Worked by ground-sluicing. Antone Frank, of Gasquet, owner.

French Hill Mine (Hydraulic).—It lies on French Hill, 3 miles S. of Gasquet, and contains 383 acres, at 2,200′ elevation. Water is taken from Coon and Thompson creeks, by a 4′x 3′ ditch, 9 miles long, built on a grade of 10′ per mile. There are 1,200′ of 14″ pipe and a No. 4 giant on the ground. The mine lies on a channel, 800′ to 1,000′ wide, filled with slightly cemented gravel 10′ to 20′ deep. A bed of pipe-clay shows in the face. The channel runs along the top of French Hill in a southwesterly direction, and it is possible that the channels at Coon Ridge and Hayne's Flat are a continuation of it. The mine has been idle several years, but it is intended to start up this (1895–96) winter. French Hill Water and Mining Co., owner; L. S. Cooper, of Crescent City, secretary and manager.

Garrison Mine (Placer).—It lies on Bald Hill, 12 miles S.E. from Crescent City, and contains 20 acres, at 2,100′ altitude. Water is collected from small gulches, and the claim is worked by ground-sluicing. Will Garrison, of Crescent City, owner.

Hayne's Flat Mine (Hydraulic).—It lies on the ridge between Coon and Garden creeks, 20 miles S.E. of Crescent City, and contains 160 acres, at 2,050′ altitude. Water is taken by two 5′x 2′ ditches from Coon and Garden creeks, 7 and 3 miles long, respectively. The latter runs through a tunnel 1,300′ long. There are 1,500′ of 13″ pipe and a No. 3 giant on the claim. The sluices are 36″ wide and paved with block riffles. The channel is well defined, 100′ wide, 150′ deep, and runs S.W. Near the bottom lies 15′ to 30′ of blue gravel, carrying coarse gold; next comes about 20′ of black gravel, cemented with iron; then red gravel to the surface. The bedrock is serpentine. To continue work it is necessary to cut 800′ of tunnel for the waste through a dike 150′ high, which runs across the channel at the southwestern end. Idle. Ed. Yates, of Crescent City, owner.

Hueniche Mine (Placer).—This is on Craig's Creek, 8 miles S.W. of Gasquet, and contains 60 acres, at 260′ altitude. The claim lies on a bar in the creek-bed. Bedrock lies 4′ below the water-level, and the gravel is about 8′ deep. The owner is constructing a tail-race, blasting out obstructions near the mouth of the creek to get the necessary fall. Ben Hueniche, of Crescent City, owner.

Kaus Mine (Hydraulic).—It is on Craig's Creek, 8 miles S.W. of Gasquet, and contains 60 acres, at 340′ elevation. Water is obtained from Craig's Creek by a 3′x 2′ ditch, and delivered through 100′ of 6″ pipe and 100′ of 7″ hose to a 2″ nozzle under 40′ pressure. The bank is 15′ to 30′ high, and shows 8′ to 12′ of gravel. The sluices are 20″ wide. Antone Kaus, of Gasquet, owner.

Kelly Mine (Placer).—It lies on Smith River, at the mouth of Patrick's Gulch, 9 miles E. of Gasquet, and contains 20 acres, at 920′ altitude. Water for ground-sluicing is taken from a small gulch. Pat Kelly, of Gasquet, owner.

Lambert Mine (Placer).—It is at Big Flat, 25 miles S.E. of Crescent City, and contains 20 acres, at 2,100′ elevation. Water for ground-sluicing is obtained from small gulches. John Lambert, of Crescent City, owner.

Larsen Mine (Placer).—It is on an old bar of Myrtle Creek, 7 miles W. of Gasquet, and contains 20 acres, at 760′ altitude. Water for ground-sluicing is taken from Cook's Gulch by a ditch ½ mile long. Charles Larsen, of Gasquet, owner.

Mayne Mine (Placer).—It is at Big Flat, 25 miles S.E. of Crescent City, and contains 20 acres, at 2,100′ altitude. Water for ground-sluicing is obtained from small gulches. John Mayne, of Crescent City, owner.

Myrtle Creek Mine (Placer).—See Waganer.

Oranna (*Crescent City*) *Mine* (Quartz).—See our Xth and XIth Reports, pp. 167 and 197. It is on Bald Hill, 12 miles S.E. of Crescent City. The vein is 1′ to 4′ wide, courses N.E. and S.W., and dips N., between metamorphic slate and serpentine. There is a 150′ tunnel and a 75′ incline. Idle since 1890. Ed. Yates et al., of Crescent City, owners.

Rice Mine (Placer).—See our XIth Report, p. 196. It lies on Mill Creek, 5 miles S.E. of Crescent City. Worked by ground-sluicing. H. Rice, of Crescent City, owner.

Rice & Murray Mine (Hydraulic).—This is on the South Fork of Smith River, 11 miles S.E. of Crescent City, and contains 40 acres, at 420′ elevation. This claim lies on the second bench of the river. Water is brought from a small tributary through a 2′x 2′ ditch, 1 mile long, and delivered through 150′ of 6″ pipe and 150′ of 7″ hose to a 2½″ nozzle, under 50′ pressure. The bank is 25′ high and all gravel. Dan Rice, of Crescent City, owner.

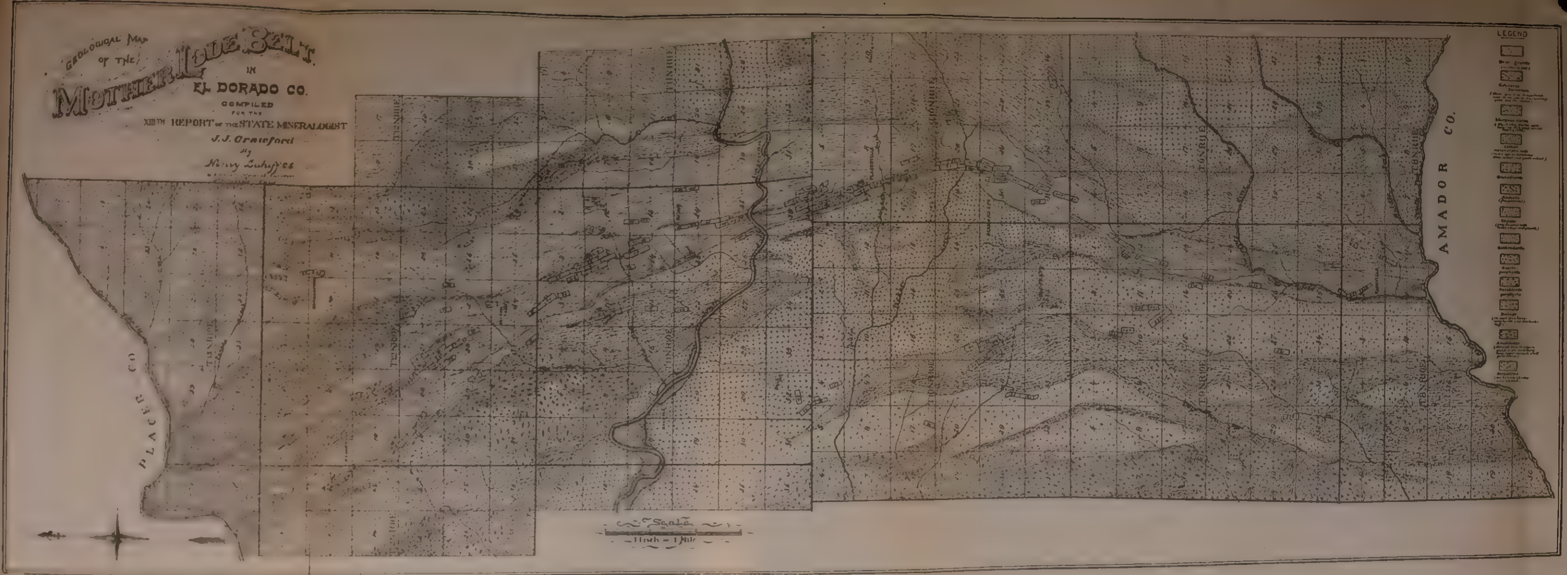
Torrejon Mine (Placer).—It lies in Redwood Gulch on the French Hill channel, and contains 20 acres, at 2,180′ altitude. Worked by ground-sluicing. José Torrejon, of Gasquet, owner.

Waganer (*Myrtle Creek*) *Mine* (Hydraulic).—See our XIth Report, p. 195. This lies on Myrtle Creek, 7 miles W. of Gasquet, and contains 60 acres, at 370′ altitude. Water is taken from Myrtle Creek by a 2½′x 1½′ ditch; 100′ of 6″ pipe and 150′ of 7″ canvas hose deliver the water, under 60′ head, to a 2½″ nozzle. The bank is 20′ high and all gravel. Charles Waganer, of Gasquet, owner.

Washington Mine (Placer).—It is a recent location on Monkey Creek, 15 miles E. of Gasquet, and contains 160 acres, at 2,620′ elevation. A 2′x 2′ ditch, 2 miles long, was, in 1895, being dug to convey water from Monkey Creek to the claim. George H. Washington, of Gasquet, owner.

Whitney Mine (Placer).—It lies on the French Hill channel, 3 miles S. of Gasquet, and contains 20 acres, at 2,160′ altitude. Water for ground-sluicing is obtained from small gulches. George Whitney, of Gasquet, owner.

Winsch Mine (Hydraulic).—This is on the French Hill channel, 3 miles S. of Gasquet, and contains 20 acres, at 2,200′ altitude. Water is brought from Bear Camp Gulch, by a 2′x 2′ ditch, 2½ miles long. There are 500′ of 11″ pipe and a No. 1 giant in use. Raymond Winsch, of Gasquet, owner.



GEOLOGICAL MAP OF THE
MOTHER LODE BELT
IN
EL DORADO CO.
COMPILED FOR THE
XIIITH REPORT OF THE STATE MINERALOGIST
J. J. Crawford
by
Henry Lahiffe

DOUBLE

ARRASTRA

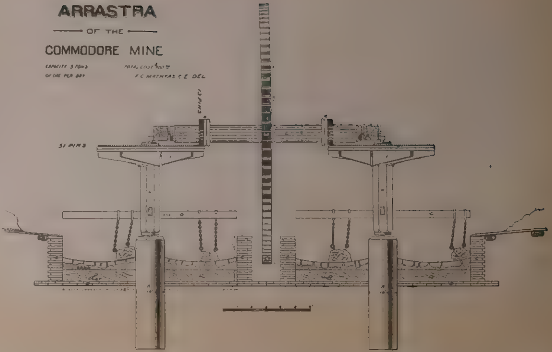
OF THE

COMMODORE MINE

CAPACITY 3 TONS OF ORE PER DAY

TOTAL COST $100.00

F C MATHYAS C E DEL



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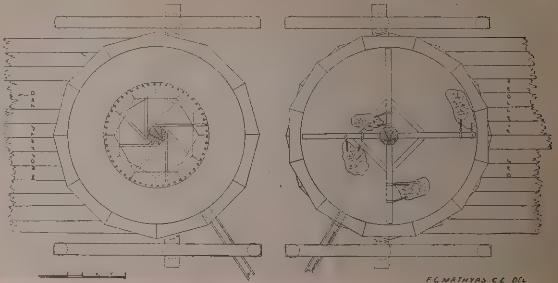

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El Dorado County.

LIST OF MINES ON ACCOMPANYING MAP.

No.	Name.	Sec.	T.N.	R.E.	No.	Name.	Sec.	T.N.	R.E.
1	Yellow Jacket	1	13	10	71	Potance	21	12	10
2	Saybert	24	13	9	72	Bessie	21	12	10
3	Sliger	25	13	9	73	Wheeler & Wilson	21	12	10
4	Golden State	32	13	10	74	Josh Billings	21	12	10
5	Blizzard	36	13	9	75	Rosecrans	21	12	10
6	Daisy	36	13	9	76	Wagner	21	12	10
7	Rough and Ready	36	13	9	77	Coloma Con.	21	12	10
8	Muntz	35	13	9	78	Croft	28	12	10
9	Cedarburg Ex.	36	13	9	79	Madrone	29	12	10
10	Railroad Hill	31	13	10	80	Buckeye	29	12	10
11	Belle	31	13	10	81	Ivanhoe	28	12	10
12	Golden Age	31	13	10	82	Emma	21	12	10
13	Cedarburg	1	12	9	83	Poor	21	12	10
14	Windy Hill	1	12	9	84	Lone Jack	28	12	10
15	Cedarburg G. M .Co.	1	12	9	85	Garden City	28	12	10
16	Atlantic and Pacific	1	12	9	86	Esperanza	28	12	10
17	Gallagher	5	12	10	87	Mt. Hope	22	12	10
18	Mameluke	3	12	10	88	Ben Franklin	22	12	10
19	Le Boeuf	3	12	10	89	Fairview	27	12	10
20	Modoc	2	12	10	90	Keystone	27	12	10
21	Van	3	12	10	91	Isabell	34	12	10
22	Plattsburgh	2	12	10	92	Isabell Ex.	3	11	10
23	Bright Hope	2	12	10	93	United	3	11	10
24	Keeler	2	12	10	94	N. St. Lawrence	2	11	10
25	Woodside	11	12	10	95	Blue Lead	6	11	11
26	Resurrection	6	12	10	96	Alhambra	6	11	11
27	San Martine	6	12	10	97	Atlantic	7	11	11
28	Bennett	1	12	9	98	Railroad	12	11	10
29	Lee	7	12	10	99	Crystal	12	11	10
30	Wolf	7	12	10	100	Washington	12	11	10
31	Welch	7	12	10	101	Harrison	12	11	10
32	Esperanza	7	12	10	102	Hope	12	11	10
33	Ohio	7	12	10	103	Old Judge	12	11	10
34	Albinos	7	12	10	104	Mary Ann	12	11	10
35	Bordt	7	12	10	105	Equinox	12	11	10
36	Flora	7	12	10	106	St. Louis	2	11	10
37	Eagle	7	12	10	107	St. Lawrence	2	11	10
38	Crockett	7	12	10	108	Gold Deposit	2	11	10
39	Spanish	12	12	9	109	Russian American	10	11	10
40	Union	12	12	9	110	United States	10	11	10
41	New Garibaldi	12	12	9	111	N. Ex. Rocky Bend	10	11	10
42	Oakland	12	12	9	112	Rocky Bend	10	11	10
43	Machine	12	12	9	113	Swansea	10	11	10
44	Greenwood	12	12	9	114	Last Chance	17	11	10
45	Lucky Marion	12	12	9	115	Shenandoah	33	12	10
46	Hickman	13	12	9	116	Caledonia	15	11	10
47	Occidental	13	12	9	117	Amazon	11	11	10
48	Eastern Star	17	12	10	118	St. Lawrence No. 2	11	11	10
49	Wisconsin	17	12	10	119	Buckeye	11	11	10
50	Golden Egg	17	12	10	120	Cleveland	11	11	10
51	Vistula	17	12	10	121	Red Hill	11	11	10
52	Maltby	17	12	10	122	Guadalupe	11	11	10
53	Dahlonega	17	12	10	123	Rising Sun	11	11	10
54	Argonaut	17	12	10	124	Gopher Bowlder	14	11	10
55	Aultman	17	12	10	125	Young America	14	11	10
56	Longfellow	17	12	10	126	St. Clair	14	11	10
57	Gladness	17	12	10	127	Ida Livingstone	13	11	10
58	Idalene	17	12	10	128	Currie (Lady Emma)	13	11	11
59	Revenge Con.	18	12	10	129	North Star	24	11	11
60	Mineral Point	19	12	12	130	Big Chunk	24	11	10
61	Revenge Con.	19	12	10	131	Jennings	20	11	10
62	Transcendent	19	12	10	132	Wilfred	20	11	10
63	Venture	19	12	10	133	Gray Eagle	24	11	10
64	El Dorado	19	12	10	134	Big Sandy	24	11	10
65	Blue Lead	19	12	10	135	Kelsey Gold and Silver	24	11	10
66	Bullion	20	12	10	136	Peterson	25	11	10
67	Clydesdale	20	12	10	137	Kelsey Gold and Silver	25	11	10
68	N. Ex. Taylor	20	12	10	138	Old Hickory	25	11	10
69	Taylor (Idlewild)	21	12	10	139	Coleman	26	11	10
70	Julia	21	12	10	140	Berryman	25	11	10

List of Mines on Accompanying Map—Continued.

No.	Name.	Sec.	T.N.	R.E.	No.	Name.	Sec.	T.N.	R.E.
141	Sthrale	23	11	10	193	Epley	20	10	11
142	Doty	23	11	10	194	Webber	20	10	11
143	Poverty Point	36	11	10	195	Ribbon Rock	20	10	11
144	Fortuna	36	11	10	196	Rattler	20	10	11
145	Estella	36	11	10	197	Cincinnati	30	10	11
146	McNeill	36	11	10	198	Keystone	20	10	11
147	Jackson	36	11	10	199	Superior	29	10	11
148	Barton	32	11	10	200	Marguerite	29	10	11
149	Merry Andrew	22	11	10	201	Larkin	29	10	11
150	Sylvester	32	11	10	202	Live Oak	30	10	11
151	Sylvester Ex.	4	10	10	203	Concordia	30	10	11
152	Webb	4	10	10	204	Champion	30	10	11
153	Lion	6	10	11	205	Griffith & Bryant	30	10	11
154	Eureka	6	10	11	206	Manzanita	31	10	11
155	Logan	6	10	11	207	Manzanita Queen	31	10	11
156	Gentle Annie	6	10	11	208	Schnieder & Co.	31	10	11
157	Independent	6	10	11	209	Lone Star	31	10	11
158	Bona Sorta	6	10	11	210	Oro Flem	31	10	11
159	Witmer	6	10	11	211	Lone Star Ex.	6	9	11
160	Sherman	6	10	11	212	Grand Victory	33	10	11
161	Gross No. 2	6	10	11	213	Salisbury	33	10	11
162	Gross No. 1	6	10	11	214	Minnesota	6	9	11
163	Van Hooker	6	10	11	215	Equator	1	9	10
164	Grant	6	10	11	216	Tullis	1	9	10
165	Wellington	6	10	11	217	Richelieu	1	9	10
166	Hallack	6	10	11	218	Golden Fleece	12	9	10
167	Old Harmon	7	10	11	219	El Dorado (Church)	12	9	10
168	Young Harmon	7	10	11	220	Vernon (Olds)	12	9	10
169	German	7	10	11	221	Springfield	12	9	10
170	Enterprise	7	10	11	222	Julia Beard	12	9	10
171	Davey	7	10	11	223	Independent	3	9	10
172	Keegan	7	10	11	224	Starlight	10	9	10
173	Chester	7	10	11	225	Pocahontas	10	9	10
174	Pacific	18	10	11	226	Lamville	11	9	10
175	Rose	18	10	11	227	Ophir	11	9	10
176	Ida	18	10	11	228	German	14	9	10
177	Maryland	18	10	11	229	Oakland	14	9	10
178	Atlantic	17	10	11	230	Vandergrift	26	9	10
179	Oregon	18	10	11	231	Monarch	27	9	10
180	Rudolph & Gillespie	17	10	10	232	Crystal	18	9	10
181	Eagle	19	10	10	233	Crystal Ex.	18	9	10
182	Eureka	28	10	10	234	Vandalia	19	9	10
183	Barnes	33	10	10	235	Big Cañon (Oro Fino)	29	9	10
184	Shaw	21	10	10	236	Montezuma	29	9	10
185	Little Giant	27	10	10	237	Montezuma	2	8	10
186	Liverpool	27	10	10	238	Nashville Quartz	2	8	10
187	Western Star	27	10	10	239	California Con.	2	8	10
188	Glines	22	10	10	240	McDowell & Wiltshire	36	9	10
189	Davidson	27	10	10	241	Central	1	8	10
190	Yellow Jacket	21	10	11	242	Nashville	1	8	10
191	Farraday	20	10	11	243	Lone Star	11	8	10
192	Henrietta	20	10	11					

Adams Gulch Mine (Quartz).—See our XIIth Report, p. 101. It is 2 miles N. of Nashville, at 1,000′ elevation, and comprises 1,500′ by 600′. The vein strikes N. and S., between slate walls, and is 2′ wide. Idle. J. C. Heald, of Nashville, owner.

Alpine (*Union Consolidated*) *Mine*.—See our VIIIth Report, p. 167. It is 2½ miles S.W. from Georgetown. Idle.

Argonaut Mine (Quartz).—See our Xth Report, p. 176. It is about 1 mile E. of Greenwood. Idle.

Armstrong & Roberts Mine (Drift).—See our XIIth Report, p. 101. It is 3½ miles S. of Grizzly Flat. W. T. Armstrong et al., of Grizzly Flat, owners.

Aultman Mine (Quartz).—See our XIIth Report, p. 102. It is 2 miles E. of Greenwood, at 1,900′ elevation, and comprises 1,500′ by 600 of patented ground. Idle. J. Smith, of Greenwood, owner.

Baldwin Mine (Quartz).—See our XIIth Report, p. 102. It is 2 miles E. of Nashville, in T. 8 N., R. 10 E., at 1,300′ elevation. Idle. E. J. Baldwin, of San Francisco, owner.

Baltic Mine (Quartz).—It is 8 miles N.W. from Grizzly Flat, at 4,250′ elevation, and comprises four claims. The 12″ vein strikes N.E. and S.W., and dips 50° E., between slate walls; three of the claims are continuous on one vein. The quartz carries iron sulphurets. The developments consist of a 4′x 8′ shaft, 40′ deep, and a tunnel, 220′ long, with 50′ running on the vein to tap the shaft, which it will do in 70′ more. A 10-stamp mill is being built to replace a small "cannonball" mill, using water-power from Baltic Creek. Twelve men are employed. Baltic Mining and Milling Co., of Placerville, owner; L. M. Barnes, of Sly Park, superintendent.

Barnes Mine (Quartz).—See Greenstone.

Beattie & Parsons Consolidated Mine (Seam Diggings).—See our XIth and XIIth Reports, pp. 203 and 102. It is 1½ miles N. of Georgetown, at 2,300′ elevation, and comprises 60 acres. Since our last Report the company has been notified to cease using a giant in its work. The company owns a water-right on Cañon Creek, and takes water through 8 miles of ditch, with a ⅜″ grade per rod, and having a capacity of 60 miner's inches, delivered under 40′ pressure. Four men are employed, sluicing. Beattie & Barklage, of Georgetown, owners.

Benfeldt (*Rogers*) *Mine* (Drift).—See our VIIIth and Xth Reports, pp. 197 and 179. It is at Smith's Flat, 2 miles E. of Placerville. Employs 12 men. — Benfeldt, of Smith's Flat, owner.

Bidstrup Mine (Quartz).—It is in Logtown, at 1,950′ elevation. Idle. F. T. Bidstrup, of El Dorado, owner.

Big Cañon (*Oro Fino*) *Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 174 and 103–479. It is 5 miles S. from Shingle Springs, at 800′ elevation. Since our last Report a station has been made on the 200′ level of the main shaft, a drift run therefrom, and an incline sunk 400′ on an angle of 26°, with the aid of compressed air; drifts have been run both N. and S. from the winze. The present supply of milling ore is procured from between the 200′ and 300′ levels. The mill capacity has been increased by the addition of 10 stamps, while the individual weight of the stamps has been reduced from 1,400 lbs. by the removal of the iron bosses on the upper ends of the stems, it having been found that the jar of the heavy stamps caused a frequent breaking of the cam-shafts. The chlorination works are enabled, through the increase of the crushing capacity, to run continuously on a daily output of 5 tons. The power for the entire plant is derived from the 340 miner's inches of water furnished by the Diamond Ridge Ditch Co. The water is dropped into French Creek and taken through a leased ditch, 2 miles long, having a capacity of 400 miner's inches, and delivered at the works under 360′ head, using 1,200′ of 16″ and 11″ pipe. Five separate water-wheels, mostly Pelton, run the machinery. Forty-five men are employed. An incorporated company of San Francisco, owner; L. R. Poundstone, of Shingle Springs, manager.

Big Jim (*Phillips*) *Mine* (Quartz).—It is 2½ miles S.W. from Latrobe, at 625′ elevation, and comprises a part of an 800-acre agricultural patent.

It carries a N. and S. vein, which dips 45° E., between slate and diabase; the definite thickness of the vein has not yet been established; the surface along the strike and below the visible outcrop of the vein yielding free gold. A shaft has been started on the outcrop, as well as a tunnel on the mill level to intersect the same, while farther north at a point 100′ below, a cross-cut 240′ long has been driven through 30′ of a silicious slate belt with intervening quartz seams, to a vein, cutting a 2′ gouge of black graphitic clay filled with iron sulphurets. A Tremaine 2-stamp steam-power mill, discharging on three sides and carrying 850-lb. stamps, is in course of erection. Nine men are at work. Chin Sing, of Latrobe, owner.

Big Sandy Mine (Quartz).—See our Xth Report, p. 173. It is $\frac{1}{4}$ mile S. from Kelsey, in T. 11 N., R. 11 E., at 1,900′ elevation, and comprises 1,500′ by 600′, and 100 acres. The vein strikes N. and S. and dips 50° E., between slate walls, 11′ apart. The quartz carries high-grade iron and lead sulphurets. The present workings are confined to the sinking of a 5′x 9′ double-compartment perpendicular shaft, which was 165′ deep in May; it will cut the vein at 240′ in depth. It is being sunk by contract to the 300′ level, with three shifts. The hoist and 6″ plunger pump are run by a 5′ Pelton wheel working under 124′ pressure, with 20 miner's inches of water from the California Ditch Co. A 10-stamp water-power mill is driven by a 3$\frac{1}{2}$′ Pelton wheel. Twelve men are employed. An incorporated company of Toledo, Ohio, owner; J. Kelley, of Kelsey, superintendent.

Bitters Mine (Placer).—See Two Channel.

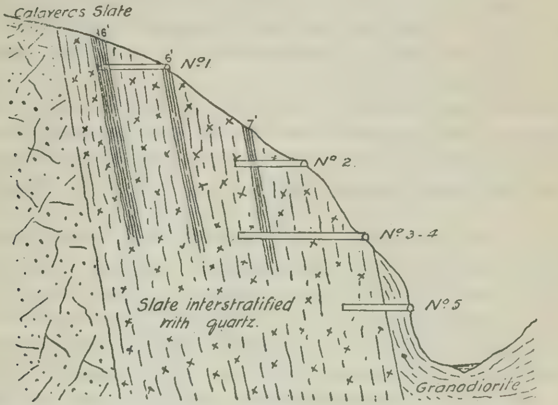
Black Lead Mine (Quartz).—See our XIIth Report, p. 104. It is 6 miles S. of Shingle Springs. Idle.

Blacklock Mine (Hydraulic).—It is 1$\frac{1}{2}$ miles N.E. from Placerville, at 2,100′ elevation, and comprises 60 acres of a lava-capped channel. The bank is from 50′ to 60′ deep, with alternating strata of pipe-clay, gravel, and sand, and 4′ of channel-wash gravel on the bedrock, carrying coarse gold. The large bowlders are removed by blasting. Water is obtained from the El Dorado Ditch Co., and costs 5 cents per inch per ten hours; 300 miner's inches are used under 180′ pressure, delivered through 1,200′ of 15″ and 11″ pipe to a giant with 11″ inlet and 4$\frac{1}{2}$″ nozzle. The tail flume is 150′ long, 2′ wide, rock paved, and set on a grade of 10″ per box; it dumps into Taylor Ravine behind four restraining brush dams, the longest being 75′ and 12′ high. Four men are employed. P. Watt and E. Piaggi, of Placerville, owners.

Black Rock Mine (Seam Diggings).—See our XIth Report, p. 203. It is at Georgia Slide, adjoining the Pacific Mine, at 2,275′ elevation, and comprises 26 acres. The company owns water-rights on Dark Cañon and Cañon Creek of 75 miner's inches, which are conveyed through 6 miles of ditch. Four men are at work. Flyn Bros. et al., of Georgetown, owners.

Blue Bank Mine (Quartz).—It is 9 miles N.W. from Shingle Springs, on the bank of Weber Creek, at 625′ elevation. The 18″ vein strikes N. and S., and dips 74° W., between slate walls. This is an old mine being reopened. The developments are a tunnel on the vein 120′ long, and a 100′ incline below the tunnel level; also, extensive surface washings and cuts. A small 2-stamp mill, with 250-lb. stamps, driven by an overshot wheel, has been placed near the tunnel's mouth for prospecting. Temporarily idle. Murphy Bros., of Lotus, owners.

Blue Gouge Mine (Quartz).—It is on Camp Creek, 9 miles E. from Pleasant Valley, at an elevation of 4,000′ on highest point and 3,200′ at creek level, comprising thirteen mining claims, giving 6,000′ along the ore-body, besides half a section of timber land contiguous. The veins strike N.W. and S.E., and dip 75° E. About 400′ of mineralized zone, between Calaveras slates on the east and grano-diorite on the west, is occupied by several parallel quartz veins, 7′, 6′, and 16′ wide, separated from the main walls and each other by intervening slates and schists of partly chloritic and talcose character, interlaminated with small sheets and kidneys of quartz. The entire body is stated by the owners to be auriferous to the extent of a general average of $2 50 per ton. They also state that the main quartz veins average $7 per ton, and the gold value decreases as the distance from the veins increases, and that none of the rock fails to give some "color." The sulphurets in this "formation" amount to 3½%, and are said to be of a good grade. The ground has been exploited through five tunnels crossing the formation. No. 1, below the outcrop, is 150′ long; No. 2, 200′ lower, 180′ long; Nos. 3 and 4 are 150′ still lower and are on the same level, though 500′, apart; they are 125′ and 225′ long; No. 5 is 150′ below the preceding, and has penetrated 180′ across the formation, and is being continued. A No. 6 tunnel has been started on the same level as No. 5, but 800′ farther south. The largest of the three veins shows a bluish-black clay seam or gouge, 1′ wide, in the center of the quartz. The mine discharges a continuous stream (about 3 miner's inches) of water from the lowest tunnel. Water-power, lumber, and timber are convenient to the mine. Seven men are employed. Being developed under bond by Mackey, Flood, et al., of San Francisco.



PROFILE OF THE BLUE GORGE MINE.

Board Mine (Quartz).—See our XIIth Report, p. 104. It is ½ mile E. of Greenwood, and consists of two parallel claims. W. Board, of Greenwood, owner.

Boneset Mine (Quartz).—See our XIIth Report, p. 104. It is 6 miles N. of Shingle Springs. M. E. Gates, of Sacramento, owner.

Boulder Mine (Quartz).—It is 8 miles N.W. from Shingle Springs, at 1,150′ elevation, and comprises 1,500′ by 600′ on a vein, 7′ to 8′ wide, which strikes N. of E. and dips 35° N.W., in grano-diorite. Four tunnels have been driven, and a fifth and lower one started; of these, only the two lower ones, 80′ apart, are in use; the upper portion of the mine being practically stoped out. No. 4 is 400′ long, with a 100′ drift on the vein. An upraise of 112′ on the slope of the vein is being driven to connect with an intermediate drift between No. 3 and No. 4, which was driven from the bottom of a winze in No. 3. The lowest tunnel, No. 5, starts 200′ perpendicularly below No. 4. A 10-stamp water-power mill is being erected. Ten men are employed. Rose Creek Mining Co., No. 163, Crocker Building, San Francisco, owner; F. W. Wilmans, president; O. S. Buckbee, of Shingle Springs, superintendent.

Bower Mine (Seam Diggings).—See our XIth Report, p. 204. It is at Greenwood, and said to have yielded two million dollars. Idle. California Water Co., owner.

Bright Hope Mine (Quartz).—It is in Sec. 2, T. 12 N., R. 10 E., 1 mile N.E. from Georgetown, at 2,700′ elevation. During the past year a 5′x 8′ shaft has been sunk 80′ and drifted from in the bottom, proving three parallel veins between slate and serpentine, varying from 7′ to 12′ in width, and dipping S.W. in the shaft. Mrs. Gibbs and H. W. Hurlbert, of Georgetown, owners.

Buckeye Hill Mine (Drift).—See our XIIth Report, p. 105. It is 9 miles N.E. from Georgetown, 2 miles W. of Volcanoville, at 2,730′ elevation. Since our last Report the drifts have been extended, and portions of the tailings reworked by Chinese. J. J. Flora, of Georgetown, owner.

Burt Alley Mine (Placer).—See our XIIth Report, p. 105. It is 2 miles below the crossing of Otter Creek by the Georgetown and Volcanoville trail. Forni & Smeder, of Georgetown, owners.

Calaveras Mine (Quartz).—It is 4 miles E. of Latrobe, at 525′ elevation, and comprises two claims under agricultural patent, designated the *Calaveras* and *Humiston*, one half mile apart. The vein trends slightly to E. of N., dips vertically on the contact of slate and greenstone, and carries a heavy clay gouge. The quartz carries 5% of sulphurets, and shows some free gold in the horn-spoon along the outcrop. On the Humiston claim the surface only has been worked by ground-sluicing, while on the Calaveras the developments consist of two 5′x 7′ shafts, 300′ apart, 53′ and 32′ deep. In the former is a 22′ cross-cut at 36′, which does not reach the wall. Several open cuts have been made across the strike of the vein. Three men are employed. Dan Klos, of Latrobe, owner.

California Jack Mine (Quartz).—It is 3 miles W. from Georgetown, at 2,315′ elevation. The vein strikes N. and S., dips 60° E., and shows a 12′ vein in the tunnel, between slate walls. The vein lies on the east side of the Mother Lode belt, and carries 2% of sulphurets. It is being developed through a tunnel, 350′ to the vein, on which 100′ of a drift has been turned north. There is a 10-stamp mill on the property, with 1,000-lb. stamps, driven by a 4′ Pelton wheel, with 30 miner's inches of water from the California Ditch Co., delivered through 1,100′ of 13″ pipe under 223′ pressure. Usually, 20 men are employed. The mine is temporarily idle. L. L. Beguette, W. McCewan, and N. D. Burlingame, of Garden Valley, owners.

Cañon Creek Fluming Co. (Placer).—See Gold Bug Mining Co.

Carrie Hale Mine (Drift).—See our XIIth Report, p. 105. It is 3½ miles S. of Grizzly Flat. Idle. J. H. Bradley, of Placerville, owner.

Cedarberg Mine (Quartz).—It is 2½ miles N.W. from Greenwood, at 2,300′ elevation. The vein strikes N. and S., and dips 57° E., between black slate walls, 15′ apart; the pay-streak in the vein averaging 1′ in width. This is an old mine on which work is being resumed. The 5′x 12′ double-compartment shaft is 318′ deep on a 57° pitch, and is supplied with a steam hoist capable of sinking 1,000′. Two men are employed. J. T. Smith, of Greenwood, owner.

Cement Hill Mine (Drift).—It is 4 miles N. of Georgetown, at 2,700′ elevation. The claim contains a lava-capped ancient channel, partially developed. Since our last Report a second tunnel, now 600′ in, has been started to strike the channel 50′ deeper than the upper 750′ tunnel, which was too high. Two men are employed. Abraham Dow, of Georgetown, owner.

Central Mine (Quartz).—It is 5 miles S. of El Dorado. One of the oldest locations on the Mother Lode. Partly developed by tunnels and shafts. — Rix, of San Francisco, owner.

Channel Bend (*Gray Eagle Bar*) *Mine* (Drift).—It is 10 miles N.E. from Georgetown, at 1,175′ elevation on the banks of the American River, 3 miles E. of Volcanoville, and consists of two claims known as the *Barnes* and the *McCall*. These two claims follow along the two arms of a bend in the former channel of the river, and the present company are exploiting the ground in the bend of the curve, behind the previously worked ground, having the appearance of a back channel. The ground is worked through a shaft 136′ deep, all in gravel, and which is connected through an intermediate drift and an upraise with an adit. The width of the gravel has not been determined; drifts from 200′ to 300′ have been run from the shaft, about 8′ or 10′ above the bedrock. Along this level the percentage of large bowlders is very great. The hoist is run by 10 inches of water from the Daggett ditch through 1,500′ of flume and 1,000′ of 6″ pipe under 800′ pressure, on a 3′ Pelton wheel; the same water is used for washing the gravel for prospecting purposes. The sluices are 300′ long. The mine makes from 8 to 10 miner's inches of water, which is also used for washing, Twelve men are employed. An incorporated company, of No. 39 Sutter Street, San Francisco, owner; G. W. Miller, of Georgetown, superintendent.

China Hill Mines (Quartz).—See our XIIth Report, p. 106. They are 3 miles S.W. from El Dorado. — Johnston, owner.

Church (*El Dorado*) *Mine* (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 191, 171, and 106. It is 2 miles S.E. of El Dorado, at 1,180′ elevation, and comprises three claims, two of which are 1,650′x 600′, and parallel, and the third, 1,500′x 600′. The vein strikes N. and S., dips 80° E., but changes the angle of the dip with depth. The three-compartment working shaft is 1,200′ deep, passing through the vein near the 400′ level, and requiring 300′ cross-cut in the bottom to the vein. The quartz makes in kidneys; sometimes these are 250′ in length; they carry 1½% of sulphurets of good grade, while the vein matter outside of the kidneys carries a larger percentage of sulphurets of lower grade; a black gouge, from 3″ to 12″ thick, accompanies the vein. Forty feet to the west of this vein is a parallel vein, 8′ wide, to which, on several of the levels, cross-cuts have been extended, but the quartz is of too low grade to permit of its being worked to a profit with the present milling capacity. The plant comprises a hoist, a 35 H.P. compressor running four Ingersoll drills, two jackhead and two plunger pumps above and three pumps below, a 10-stamp mill, with stamps of 950 lbs. each, and four Frue vanners; all driven by 100 miner's inches of water from the Diamond Ridge Ditch Co., and applied under 465′ pressure through 3,250′ of 15″ and 11″ pipe on a 6′ Dodds wheel for the compressor, two Peltons for hoist and pumps, and a 6′ Pelton for the mill. The present ore-supply is obtained from below the 1,000′ level. Thirty men are employed. Church Gold Mining Co., of San Francisco, owner; James Richards, of El Dorado, superintendent.

Cincinnati Mine (Quartz).—It is 2½ miles S. of Placerville, at 1,750′ elevation. Idle. M. Miller and D. J. Knighton, of Diamond Springs, owners.

Claghorn (*Growers*) *Mine* (Drift).—It is on Cedar Creek, 2 miles S. of Fairplay, at 2,910′ elevation, and is an ancient channel running N.E. and S.W., over a granite bedrock. There is a tunnel running on the rim 200′, where the pay-gravel is only 18″ deep, covered by a layer of cemented sand, which furnishes a good roof; there are no large bowlders. The gold is both coarse and fine. The main channel has not yet been reached. The washing of the gravel is done in a bedrock cut with the help of one box, with water from the Empire (Plymouth) ditch. Two men are at work. Capt. G. S. Claghorn, of Fairplay, owner.

Confederate Mine (Drift).—It is 2½ miles S.W. from Fairplay, at 2,725′ elevation, and comprises 40 acres. A tunnel has been driven 250′ through granite bedrock and cemented sand, and the bedrock still pitches away. A second tunnel, run 200′ on the course of the channel and partly in the bedrock, shows some cemented gravel and granitic sand, but gives no definite results as to the course or width of the channel. Two men are at work. D. M. Dunn and A. F. Gillespie, of Fairplay, owners.

Cousin Jack Mine (Quartz).—See our XIIth Report, p. 107. It is 5 miles S.W. of Grizzly Flat, at 2,800′ elevation. The vein courses N. and S. Idle. Mrs. M. Jeffrey, of Grizzly Flat, owner.

Crown Point (*Bald Eagle*) *Mine* (Quartz).—See our XIIth Report, p. 107. It is 1½ miles S.E. of Diamond Springs. James Richards et al., of Diamond Springs, owners.

Crystal Mine (Quartz).—See our XIIth Report, p. 107. It is on the Middle Fork of the Cosumnes River, 5 miles S. of Grizzly Flat. Idle. L. L. Alexander, of Omo Ranch, owner.

Crystal Mine (Quartz).—See our XIIth Report, p. 107. It is 3½ miles S. of Shingle Springs, at about 1,800′ elevation. Idle. G. Phelps et al., of Shingle Springs, owner.

Crystal Mine (Quartz).—It is ½ mile N. of Cool, at 1,900′ elevation. The vein courses N. and S. and dips 15° W. It shows stringers of quartz in quartz-porphyry, with limestone belt on the east. The quartz is milk white, with groups of crystals, and carries some copper sulphurets. The developments consist of a 25′ perpendicular shaft, from which an incline, 60′ in length, is sunk on the pitch of the vein, showing three stringers of quartz. There is another incline, 60′ long, from the surface; none of the works penetrate more than 70′, perpendicular depth. Two men are usually employed. E. Terry, C. Ashley, and C. Schulz, of Cool, owners.

Dailey & Bishop Mine (Quartz).—It is on Clear Creek, 2½ miles S. of Grizzly Flat, at 3,475′ elevation, and comprises two full claims on a vein striking E. of N., dipping 75° E., in a slate formation, and varying in thickness from a seam to 3′. The quartz is glassy, with few sulphurets. The main working-tunnel has been driven 800′ along the vein, with a short cross-cut to the east; some stoping has been done above the tunnel. Three hundred feet from the tunnel a shaft is being sunk. A 10-stamp mill is in course of completion, with 750-lb. stamps, to be driven by a 4′ Knight wheel, with water from Clear Creek through a 2-mile ditch, giving 200′ pressure. A new style of concentrator, called the Goldbug Chief, is being used in this mill; in its essential features it is an over-grown "rocker." Eight men are employed. — Bishop et al., of Grizzly Flat, owners.

Dalmatia Mine (Quartz).—See our VIIIth, Xth, and XIth Reports, pp. 177, 174, and 201. It is 6 miles N. of Placerville, and ½ mile E. of Kelsey, at about 2,600′ elevation. Idle. American River Syndicate (Ltd.), of London, owner; William Husband, of Kelsey, superintendent.

Darling Mine (Quartz).—See our XIth Report, p. 202. Idle.

Davidson Mine (Quartz).—See our XIIth Report, p. 108. It is 3 miles N.W. of El Dorado, at about 1,700′ elevation. Idle. Thos. Davidson, of El Dorado, owner.

Defiance Mine (Quartz).—See our XIIth Report, p. 108.

Dividend Mine (Placer).—See our XIIth Report, p. 108. It is 3 miles W. of Shingle Springs, in T. 10 N., R. 9 E., at 1,280′ elevation, and comprises 3,136 acres on Kelly Creek. Since our last Report the property has changed owners, and about one half acre of ground has been worked with four men. D. C. Hodgkins, of Shingle Springs, owner.

Donozo Gold Mine (Quartz).—See our XIIth Report, p. 108. It is ½ mile E. of Greenwood. Idle. J. Donozo, of Greenwood, owner.

Eagle Mine (Quartz).—It is 1½ miles N.W. from Grizzly Flat, at 3,525′ elevation, and comprises three claims. The 3′ vein strikes E. of N., and dips 75° W., in grano-diorite. The quartz carries a good percentage of iron, zinc, and lead sulphurets in the pay-shoot, mostly next to the footwall. The pay-shoot has been followed 150′ in the tunnel, showing in the breast a vein 6′ wide between walls. The tunnel is 780′ long, and will be extended to tap a 200′ shaft. Two upraises connect this tunnel with the surface. Two men are employed. Mrs. Kate Smith, of Grizzly Flat, owner; S. Kendrick, of Grizzly Flat, superintendent.

Eagle King Mine (Quartz).—See our XIIth Report, p. 108. It is 2½ miles N. of Grizzly Flat, at 3,600′ elevation. An adjoining claim, known as the *Sunday*, has been added to it. The vein, 3′ to 4′ wide, strikes E. of N., and dips 75° W., in grano-diorite. The main working-tunnel has reached a length of 1,450′, and is still being driven ahead; a cross-cut from this level is being made to the Sunday vein, which will soon be cut. There is a 30′ winze below the main level, as well as a 150′ upraise connecting it with the surface. Some stoping has been done above the level. There is a 10-stamp water-power mill on the property, with 650-lb. stamps, of a crushing capacity of 16 tons per day; at present idle. Water is obtained from Tingley's ditch out of Big Cañon Creek, which is 5 miles long, and has a capacity of 50 miner's inches delivered under 130′ head to a 4′ Pelton wheel. When mill is running, 12 men are employed. John Melton and E. W. Witmer, of Placerville, owners.

Edner Mine (Quartz).—See our XIIth Report, p. 109. It is 7 miles E. of Fairplay, at 3,275′ elevation, and comprises 160 acres, held under an agricultural patent. The vein strikes N. and S., and dips 65° W., between granite and slate walls, widening as it goes down. The fissure is only partially filled with quartz; the latter is about 1½′ wide. A shaft has been started which is now 28′ deep, and a tunnel, now 50′ long, started to tap the shaft at about 170′ depth. A siphon takes the water from the shaft. Two men are at work. Charles Edner, of Omo Ranch, owner.

El Dorado Big Tunnel Co. (Quartz).—See our XIIth Report, p. 109. Since our last Report it has been acquired by the owners of the Gentle Annie Mine, who are driving the tunnel ahead. Gentle Annie Mining Co., of Placerville, owner.

Elliot Mine (Quartz).—See our XIIth Report, p. 109. It is on the south bank of Weber Creek, 2½ miles S. of Placerville. Idle. J. J. Elliot, of Placerville, owner.

Emma Mine (Quartz).—See our Xth Report, p. 176. It is a location adjoining and belonging to the Idlewild.

Epley Mine (Quartz).—It is on the Mother Lode belt, 2 miles S. of Placerville. Idle. See Placerville Gold Quartz Mining Co.

Esperanza Mine (Seam Diggings).—It is ¾ mile E. of Greenwood, at 1,950′ elevation, and comprises 1,500′ by 600′; the ground was formerly hydraulicked, but is now ground-sluiced by one man. P. Ritchie et al., of Greenwood, owners.

Esperanza Mine (Quartz).—See our Xth and XIIth Reports, pp. 175 and 109. It is 1 mile N.W. of Garden Valley. Provided with a steam hoist and a 20-stamp water-power mill. Idle. N. D. Burlingame, of Garden Valley, owner.

Eureka Mine (Quartz).—See our XIth and XIIth Reports, pp. 203 and 109. It is in Georgetown. Was equipped with hoisting works and a 10-stamp mill, which have been partially removed. Idle for years. E. B. Lee, of New York, owner; C. M. Fitzgerald, agent.

Fisk Mine (Quartz).—It is 1½ miles N. of Placerville, on Quartz Hill, at 1,900′ elevation, and comprises two claims of 600′ by 600′ each. The vein strikes N. and S., dips W., turning over later to the E., between serpentine on the west and black graphitic slate on the east. About 70′ E. of the vein is a belt, 100′ wide, of silicious slate and porphyry, carrying two seams of quartz, on one of which pockets of gold are not infrequent. The developments consist of two tunnels, one 50′ above the other on the one claim: No. 1, cross-cutting to the vein 75′ and turned 100′ on the vein; No. 2, though 160′ in length, lacks 40′ to reach the vein. On the second claim are three cross-cutting tunnels 75′ long, all about on a level and connected along the strike. The No. 2 tunnel on the first claim is intended for the main working-tunnel for both claims; it is connected by an upraise with the surface, 130′ from the mouth of the tunnel. The croppings extend from 25′ to 100′ in width, the quartz carrying some sulphurets and developing occasional pockets. Three men are at work. J. H. Skinner, of Placerville, owner.

Fort Yuma Mine (Quartz).—See our XIIth Report, p. 110. It is 6 miles S. of Shingle Springs. Idle. Hale & Baughman, of Omo Ranch, owners.

Franklin (*Tockey*) *Mine* (Drift).—It is 2½ miles E. of Placerville, at 2,075′ elevation, and comprises 50 acres on an ancient channel. A 1,400′ tunnel has been driven through the bedrock, and a 75′ upraise made to a high gravel bench, upon which a 600′ drift has been run. The breasts are carried 4½′ high, 30′ wide, and are timbered with post and cap. The channel carries white quartz gravel, somewhat cemented; a breaster removing 3 tons per shift. The gravel is worked in a 10-stamp mill, crushing 6 tons per stamp per day, through a No. 10 wire screen driven by a 4′ Knight wheel under 185′ head, with water received from the El Dorado Water Co.'s ditch through 675′ of 7″ pipe. Below the mill is 100′ of sluices. During the past year about an acre of ground has been worked. Twenty-six men are employed. Messrs. Wright, of Indianapolis, and Picket & Clarke, of Placerville, owners; Thomas Clarke, of Placerville, superintendent.

French Mine (Seam Diggings).—See our XIIth Report, p. 110. It is ¼ mile W. of Greenwood, at 1,700′ elevation. Idle. L. Lechance, of Greenwood, owner.

French Hill Mining Co.'s Mine (Quartz).—See our XIIth Report, p. 110. It is 6 miles N. from Greenwood, near Spanish Dry Diggings, at 1,900′ elevation. Idle. A. J. Johnston et al., of Sacramento, owners.

Garfield Mining Co.'s Mine (Quartz).—See our XIIth Report, p. 110. It is ¼ mile from Volcanoville. Idle. E. W. Chapman, of Greenwood, owner.

Garfield and Excelsior Consolidated Gold Mine (Quartz).—See our XIIth Report, p. 111. It is 1 mile N.E. of Greenwood. Idle. F. G. Bilty et al., of Greenwood, owners.

Garibaldi Consolidated Gold Mine (Quartz).—See our XIIth Report, p. 111. It is ¾ mile from Greenwood. Idle. Mrs. Lee and J. Wolf, of Greenwood, owners.

Gentle Annie Mine (Quartz).—See our Xth and XIIth Reports, pp. 177 and 111. It is 1½ miles N. of Placerville, in Sec. 6, T. 10 N., R. 11 E., at 2,000′ elevation, and comprises a number of claims. The principal ones are: the *Accidental*, *Belle*, *Big Tunnel*, *Bona Sorta*, *Fortuna*, *Gentle Annie*, *Humming-Bird*, *Independence*, *Jackson*, *Lion*, *Logan*, *McNeill*, *Napier*, *Poverty Point*, *Sobrante*, *South Extension of Napier*, and *Surplus*. Since our last Report the main shaft on the Gentle Annie has been continued to the 300′ level, with a 30′ sump, an increase of 100′, and a level driven north 260′ on the vein, which is 8′ wide and well mineralized. At 240′ from the shaft an upraise, at present 30′ high, is being made to connect with the works above. The 200′ level has been extended 400′ north, showing an 8′ vein, and 200′ south, showing 15′ of quartz. The company, in getting possession of the Big Tunnel claim, have utilized its compressor for hoisting and pumping at the Gentle Annie shaft, as well as for running the machine drills. The compressed air is conveyed through 3,000′ of 5¼″ pipe, reducing to 1,500′ of 3″ and 2″ branch pipes.

In the *Big Tunnel Claim* the main tunnel has been extended 150′, passing through an 8′ quartz vein and 125′ of an excellent quality of roofing slate. In the mill 64 sq. ft. of plating has been replaced by 32 yds. of Brussels carpet; a 2′x 4′ amalgamating barrel put in for working the richer grades of slimes. The carpets are washed twice every shift into a separate tank; after settling, the slimes are placed with water in the amalgamating barrel, 500 lbs. to a charge, and ground with the aid of iron balls. Later, from ½ to ¾ of a pint of commercial sulphuric acid is introduced, and the grinding continued. Two hours prior to discharging, quicksilver is introduced. When ready to discharge, a catch-all box, with a partition in the center, is placed on the apron-plate beneath the barrel, which is turned, with the plug for discharging the quicksilver on the upper side, slightly to the front, and an iron pipe, from 2′ to 3′ long, tightly inserted in the plughole, through which water from the hose is introduced to boil out the finest slimes, which are caught in the catch-all box below, and float out over the apron-plate. The pipe is then removed, and the hose plays directly through the plughole for a short period. The plughole is then closed, and the manhole is turned on top, and the coarser material gradually hosed out; while, at the same time, the quicksilver is forced by the water to the ends of the barrels. The bulk of the material having been washed out, the residue, with the quicksilver, is removed, and the latter freed from any iron, and squeezed through the straining cloth. Fifteen men are employed. John Melton and Benjamin Parlow, of Placerville, owners.

German (*Haeger*) *Mine* (Quartz).—It is 5 miles S. from El Dorado, at 1,150′ elevation, and comprises 1,500′ by 600′, and an 80-acre lot. The vein strikes N. and S., and dips 60° E., between a slate hanging-wall and a porphyry foot-wall, with 8′ of quartz with high-grade sulphurets. A 5′x 8′ double-compartment shaft is 130′ deep on the slope, with a 50′ drift. At present a cross-cut, to date 80′ long, back of the shaft is being driven to a parallel vein. The hoist and Cornish pump are driven by a 3′ Pelton wheel under 300′ pressure with 7 miner's inches of water from the Diamond Ridge Ditch Co. Twelve men are employed. H. Haeger and J. H. Stratten, of El Dorado, owners.

Giltedge Mine (Drift).—It is 3 miles S. of Fairplay, at 2,800′ elevation, and comprises 160 acres on an ancient channel. The gravel is capped with a layer of cemented sand and pipe-clay, and carries, besides quartz, slate bowlders and considerable clay. The gold is mostly on the bedrock, and coarse. The main gangway, 300′ long, is timbered with 6½′ posts and 3′ 6″ caps, and is driven partly in the bedrock the entire distance; the breasts are carried 4′ high and 20′ wide. The gravel is washed twice; first through 400′ of a bedrock cut, after which it is left to slack; only half the gold being obtained from the first washing. The mine water is used for washing purposes. Two men are at work. Norton & Amsden, of Uno, owners.

Gold Bug Mining (*Cañon Creek Fluming*) *Company* (Placer).—See our XIIth Report, p. 105. It is 3 miles N.W. from Georgetown, at 2,150′ elevation, and comprises 4 miles of the bed of Cañon Creek immediately below Georgia Slide, and 300 acres of adjacent ground. The tailings from the Georgia Slide seam diggings and adjacent mines emptying into this portion of Cañon Creek have been restrained by a natural rock-dam, which the present company purpose cutting through with a sluiceway deep enough to permit the rewashing of these tailings, as well as any virgin gravel that remains on the original creek-bed. On the upper stretch of 1½ miles a grade of 83′ can be had by cutting down the rock barrier 20′ and giving the sluiceway a width of 12′ to 14′. At present the ledge has been cut down for a length of 120′ to a depth of 20′, and for 400′ to a depth of 12′. Two flumes have been built, one 100′ long and 12′ wide, on a grade of 13″ to 12′, together with a 12′x 54′ undercurrent; the other is 50′ long, 12′ wide, with an undercurrent 36′ long and 22′ wide. The paving is made of alder blocks, 6″ and 12″ deep. Up to date, 1,000′ of the channel has been partially cleared. Four thousand miner's inches of water is available. Thirty-five men will be employed. An incorporated company of Cleveland, Ohio, owners; H. Tenbrock, of Georgetown, superintendent.

Golden State Mine (Quartz).—See our XIth and XIIth Reports, pp. 204 and 111. It is 4 miles N.E. from Georgetown, at 2,700′ elevation. Three men are employed. W. Barklage et al., of Georgetown, owners.

Golden Trace (*Bullard*) *Mine* (Quartz).—It is 2½ miles N. of Grizzly Flat, between the Treat and Melton mines, at 3,400′ elevation. The vein strikes N. and S., and dips 70° W., in a granite formation; it is 2½′ wide and carries iron, zinc, and lead sulphurets. There is a 250′ tunnel on the vein, with two upraises, 25′ and 35′ high. The North Fork of the Cosumnes River passes through the claim, which is also well supplied with timber. Only assessment work is done.

Gopher and Boulder Mine (Quartz).—See our VIIIth Report, p. 175. It is ½ mile W. of Kelsey, at 1,950′ elevation, and comprises 3,000′ by 300′. The vein strikes N. and S., and dips 60° E., between a slate foot-wall and greenstone hanging-wall, and is from 8′ to 9′ wide. The 200′ incline shaft is being kept pumped out, otherwise the property is idle. The hoist is run by water-power, while the 20 stamps and two 5′ Huntington mills are run by electricity generated on Rock Creek. Three men are employed. Gopher and Boulder Mining Co., of Kelsey, owner; W. Husband, of Kelsey, manager.

Grand Victory Mine (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 194, 178, and 112. It is on Squaw Creek, 7 miles S.E. from Placerville, at 2,100′ elevation, and comprises 160 acres of mineral land, on which are the quartz locations. The ore-body is in a black quartzite lying in slate of the Calaveras formation near the granite contact, striking N.W., with a nearly vertical dip. Since our last Report the tunnel on the mill-level has been extended to 500′, and two shafts, a vertical and an incline, 85′ and 100′ deep, have been sunk, and both connected by a drift at the bottom. Two separate ore-bodies have been cross-cut, showing a width of 64′ and 125′, with slate intervening. These ore-bodies are being chambered out and timbered with square sets. Connection has also been made with the large pits mentioned in previous reports, from which the ore was formerly quarried, furnishing a good natural ventilation. The ore carries 3% of low-grade sulphurets. The hoist on the incline shaft and the machine drills are run by compressed air. The main station and tunnels, as well as the mill and general plant, are all lighted by electricity from a 100-light Mather shunt-wound dynamo, with a capacity for 125 sixteen candle-power, 100-volt lamps. The dynamo is connected direct with the counter-shaft in the mill. Of the 50 stamps in the mill, 20 are in operation; they weigh 1,000 lbs. each, and are run at 95 drops of 6½″, giving a crushing capacity of 2 tons per stamp per day, There are nine Frue and five Triumph concentrators, and the entire outfit is run by an 8′ hurdy wheel with hemispherical buckets, under 107′ head, with water from the Diamond Ridge Ditch Co. The chlorination plant, consisting of a 5-ton furnace, vats, etc., will be started as soon as the entire 50 stamps are dropping. Thirty-three men are employed. J. C. Wright, of Indianapolis, Ind., and H. E. Pickett, of Placerville, owners; T. J. Houghton, of Placerville, superintendent.

Gray Mine (Quartz).—See our XIIth Report, p. 119. It is 3 miles N. of Shingle Springs. Idle. D. C. Hodgkins, of San Francisco, owner.

Gray Eagle Cliff Mine (Drift).—See our XIIth Report, p. 112. It is in Volcanoville, at 2,900′ elevation, and contains 100 acres. D. C. Webster, of Georgetown, owner.

Greenstone (*Barnes*) *Mine* (Quartz).—See our XIIth Report, pp. 102 and 112. It is 3 miles N.E. of Shingle Springs, at 1,500′ elevation. Idle. H. Barnes, of Shingle Springs, owner.

Griffith & Bryant Consolidated Mine (Quartz).—See our XIIth Report, p. 112. It is in Sec. 30, T. 10 N., R. 11 E., 1 mile E. of Diamond Springs, at 1,700′ elevation, and comprises 3,000′ by 600′. Three men are at work. C. F. Bryant, of Diamond Springs, owner.

Grizzly Flat Gold Mining Co.'s Mine (Drift).—It is in Grizzly Flat, at 3,725′ elevation, and comprises 320 acres. The channel runs N. and S., and was formerly worked by the hydraulic method. Latterly a main drift has been driven 150′ to the center of channel, partly in bedrock, and a gangway started, now 150′ long, up the channel. The main tunnel was continued across to the opposite rim, 550′ distant, showing either an island 18′ across in the center of the channel or a back channel. The main drift has steel T rails, 4 lbs. to the foot. The mine does not make any waste, and has good natural ventilation. No breasting has been done to date. The granite bedrock requires no timbering. The gravel is 4′ thick on the bedrock cemented, capped with 2′ of cemented sand, followed by 3′ more of gravel overlaid with 40′ of lava; it will have to be milled to free the gold, which is scaly and partly black. Water is diverted from Steely Fork of the Cosumnes River through 7 miles of ditch, of 800 miner's inches capacity, and delivered in the old hydraulic pit under 180′ pressure, where the mill is to be erected. Four men are employed. An incorporated company, owner; G. E. Mainhart, No. 211 Sansome Street, San Francisco, secretary; A. A. McDonald, of Grizzly Flat, superintendent.

Grouse Gulch Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 178 and 113. It is 1½ miles W. of Grizzly Flat, at 3,700′ elevation, and contains 1,500′ by 600′. Idle. Mrs. K. Smith, of Grizzly Flat, owner.

Hardscratch Mine (Quartz).—It is 2 miles W. of Grizzly Flat, at 3,500′ elevation. The vein strikes N.E. and S.W., and dips W. The vein is from 2″ to 18″ wide, between granite walls, greatly decomposed, furnishing running ground when saturated with moisture. A 120′ cross-cut reaches the vein, upon which is a 100′ drift; there is also a 26′ shaft. The entire workings were closed at date, on account of a run or slide on the surface. There is a small water-power mill of the Dyer cannonball pattern, with a capacity up to 4 tons per day. The power is brought from String Cañon through 1 mile of ditch and 12″x 12″ flume, of 80 miner's inches capacity, to a 3′ Dyer wheel with cast-iron buckets, under 65′ head, giving the mill 90 revolutions per minute. Two men are at work. Alderson & De Launy, of Grizzly Flat, owners.

Harmon, Old and Young, Mines (Quartz).—They are 1 mile N. of Placerville, and are included in the group of mines from the American River to Weber Creek. Idle. See Placerville Gold Quartz Mining Co.

Harnish Mine (Drift).—It is 1½ miles S. of Fairplay, at 2,820′ elevation, and comprises 40 acres. It is on the old Fairplay channel, and has a tunnel started on the bedrock; 50′ in the bedrock pitched, and the tunnel was turned along the rim. The claim, which has only recently been opened, shows 4′ to 5′ of gravel next the bedrock, carrying considerable mica, with very few bowlders. One man extracts 3 tons of gravel per day. Two men are at work. S. A. D. White and J. H. Harnish, of Fairplay, owners.

Havilah (*Hendy or Nashville*) *Mine.*—See Nashville.

Hayward Gravel Mine (Hydraulic).—It is in Indian Diggings, at 3,150′ elevation, and comprises 358 acres on an ancient channel. The bank is 275′ high, of which 159′ is gravel, with cement capping. Water is taken from the Middle Fork of Cosumnes River through the Empire (Douglas) ditch, 28 miles long, 5′ wide on top, 2½′ on bottom, 2½′ deep, with 16′ grade per mile, carrying 900 miner's inches of water, delivered at the mine under 260′ pressure. The dump is into Indian Creek. A sawmill is under construction. Seven men are employed. Plymouth Consolidated Gold Mining Co., of Oakland, owner; J. Crane, of Plymouth, Amador County, superintendent.

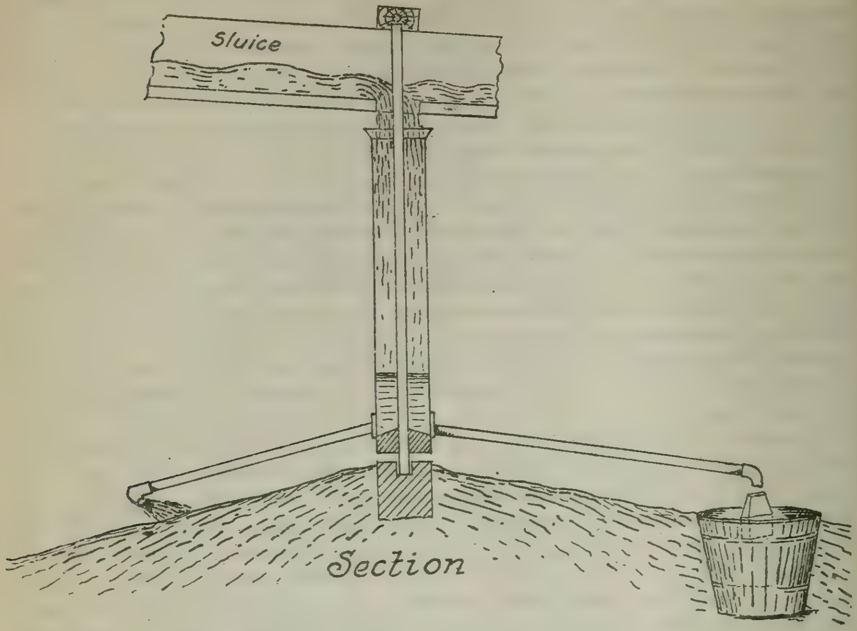
Humphrey's Mine (Quartz).—It is 2½ miles S.W. from Fairplay, at 2,475′ elevation. The 16″ to 24″ vein strikes E. and W., and dips 80° S., between granite walls. The developments comprise a 4′x 6½′ double-compartment shaft, 15′ deep; at the shaft collar a tunnel, driven 70′ on the vein, shows a 20″ vein in the breast. The quartz carries 1½% of iron and lead sulphurets. Three men are at work. O. H. Elliott, of San Francisco, owner.

Ibid Mine (Quartz).—See our XIIth Report, p. 113. It is 1 mile S. of Grizzly Flat. Idle. C. W. Watts and T. D. Crocker, of San Francisco, owners.

Idlewild (*Taylor*) *Mine* (Quartz).—See our VIIIth, Xth, XIth, and XIIth Reports, pp. 168, 176, 205, and 113. It is 3 miles E. from Greenwood, and 5 miles W. of Georgetown, at 2,125′ elevation. Since our last Report the main shaft has been carried down to a depth of 670′, and drifts have been opened along the vein for a distance of 500′ from the shaft. The plant on this mine is one of the most complete to be found for its size, and is admirably arranged, comprising, besides the hoist, pumps, compressor, machine-shop, mill, concentrating floors, two saws (one for lumber, with a capacity of 10,000′ per day, and the other for cutting wood), boarding-houses, offices, laundry, dwelling-houses for the men and officials, etc. The entire property is lighted by electricity, which is also applied in part as power. The compressor, 18″x 24″, runs three Ryan power drills. On the 500′ level is an electric pump, and a duplex Worthington on the surface, run by compressed air; also a Dow hydraulic plunger pump. The crushing capacity of the mill has been increased by the addition to the 40 stamps of a Dodge pulverizer of 25 tons capacity per twenty-four hours. There are 14 wheels to drive the machinery, taking water from the California Water Co. A new automatic sampler for mill tailings is used at these works, consisting, in general terms, of a Barker re-action water-wheel, driven by the tailings water, with one of the arms extended 1′ beyond the rest, and with the outlet turned downward, in which position it passed at each revolution over a covered bucket, with a raised slot, $\frac{1}{16}$″x 4″, in the center of the lid, which permits of a small amount passing into the bucket. (See illustration, p. 146.) Sixty-two men are employed at the works. Idlewild Gold Mining Co., owner; E. W. Chapman, of Greenwood, manager.

Independence Mine (Quartz).—It is 3 miles N.E. from Omo, at 3,000′ elevation, and comprises three claims, designated the *Independence*, *Louisiana*, and *Whim Lead*, situated on the same vein as the Stillwagon, striking N.E., and dipping S., between granite walls. There is an old 90′ shaft and three tunnels. Only assessment work. W. P. Stanley, of Placerville, manager.

IDLEWILD CO'S TAILING SAMPLER



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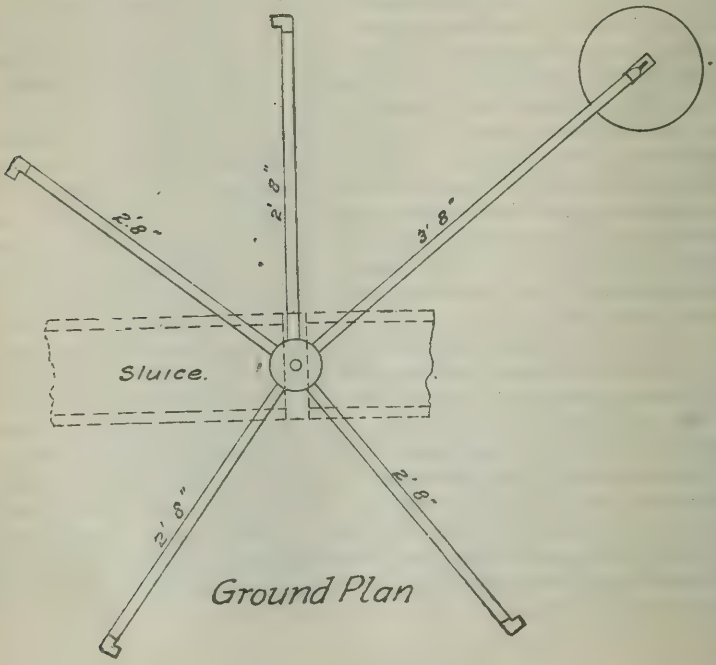


Ground Plan

Indian Creek Land and Mining Co.'s (*Shaw*) *Mine* (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 193, 181, and 114-481. It is situated 7 miles W. of Placerville and 3 miles N.W. from El Dorado. An incorporated company, owner; D. W. C. Morgan, of El Dorado, superintendent.

Indian Diggings Creek Mine (Placer).—It is at Indian Diggings, at 3,000′ elevation, and comprises 102 acres, extending 1 mile down the creek. The bedrock has not been reached yet. The gravel contains two grades of gold; that taken from the main channel sells for over $20 per oz., while the rim channel gold is worth only $17 50 per oz. The wash in the channel consists of quartz and slate underlaid with marble. Water for washing is taken from the Empire ditch with 300′ pressure, delivered to a small-sized giant with 2″ nozzle. The flume is 300 yds. long, 24″ wide, paved with rock, and set on a 5″ grade to the box, and dumps into Scott Creek. Water costs 5 cents per inch. Five men are at work. J. Kohlert, of Indian Diggings, owner.

Inez Mine (Quartz).—See our Xth and XIIth Reports, pp. 171 and 114. It is 8 miles S. of El Dorado and 1 mile N.E. of Nashville. Idle. J. C. Heald, of Nashville, superintendent.

Jerusalem Mine (Hydraulic).—See our XIIth Report, p. 114. It is 1¼ miles E. of Placerville. Idle. Thomas Alderson, owner.

Josephine Mine (Quartz).—See our VIIIth Report, p. 165. It is ½ mile E. of Volcanoville, at 2,900′ elevation. During the past season an old tunnel has been cleared out. Idle. J. W. McCall et al., of Nevada City, owners.

Kates (*Norris*) *Mine* (Drift).—See our XIIth Report, p. 114. It is 1¼ miles E. of Volcanoville. Idle. S. P. Kates et al., of Georgetown, owners.

Kentucky Flat Gravel Mine (Drift).—See our XIIth Report, p. 115; also, Two Channel Mine.

Lady Blanche Mine (Quartz).—It is 3½ miles E. of Fairplay, at 4,480′ elevation, and comprises three claims. The vein, 1′ to 4′ wide, strikes N. 20° W., and dips 50° E., between a slate foot-wall and a porphyry hanging-wall. The developments consist of an 180′ tunnel near the end line, and an 80′ cross-cut 225′ below, which will have to be extended 375′ to cut the vein. Three men are at work. J. E. Stratton, of San Francisco, owner.

Lady Emma Mine (Quartz).—It is 1 mile E. of Kelsey, at 2,000′ elevation. The 4′ vein strikes N. and S., and dips 60° E., between slate and porphyry walls. The vein is worked through a 5′x 6′ incline to a depth of 300′, with drifts on the vein of 150′ both ways at every 100′. The bottom drift was being run in May, 1896, showing that the vein increases with depth. A second and vertical shaft, 150′ W. of the main slope, has reached a depth of 50′, where a cross-cut is being driven to intercept a vein on the west, about 40′ distant, which shows 6′ wide on the surface. The east vein carries mariposite. The entire works are run by 18 miner's inches of water through 600′ of 11″ pipe, on an 8′ Morey wheel for the pumps and an 18″ Pelton wheel for the hoist, under 155′ pressure, and obtained from the California Water Co. The 4″ plunger pump raises 3 miner's inches of water. The recently erected mill has 10 stamps of 800 lbs. weight, with two concentrators and a Gold King amalgamator, all geared from a 5′ Pelton wheel. Twelve men are employed. Worked under bond by an incorporated company of San Francisco. S. W. Beardslee, of Kelsey, superintendent.

La Moille Mine (Quartz).—See our XIIth Report, p. 115. It is 2 miles S. of El Dorado. Idle. H. Sutliffe, of San Francisco, owner.

Larkin Mine (Quartz).—It is 3½ miles S. of Placerville and 1 mile E. of Diamond Springs, at 1,800′ elevation, and comprises 2,200′ on the strike of the vein, with a width of 1,000′ at one end and running to a point at the other end. The 3′ ledge strikes E. of N., and dips 80° E. The quartz makes in kidneys between the slate and greenstone walls. The vein is worked through a single-compartment vertical shaft 250′ deep, with drifts both ways on the 100′, 200′, and 250′ levels. The light hoist and 4″ jackhead pump are run by steam. Seven men are employed. A 5-stamp steam-power mill, with frame for 10, is being built. Larkin Mining Co., of San Francisco, owner; Col. D. H. Jackson, of Placerville, superintendent.

Last Chance Mine (Quartz).—It is on Quartz Cañon, 1 mile S. from Volcanoville, at 2,900′ elevation. The vein, 5′ wide, strikes E. and W., and dips 55° S., between a porphyry hanging-wall and a slate foot-wall. A perpendicular shaft has been sunk 50′, and a short drift extended south 15′ from the bottom, exposing a 5′ vein of low-grade ore, which is cut at another point 100′ deep by a 400′ cross-cut. A 4-stamp mill, with 500-lb. stamps, situated on Otter Creek, 1 mile from the shaft, and driven by an 18′ overshot wheel, with a crushing capacity of 4 tons per day, belongs to the property. One man is at work. Wilson Cary, of Georgetown, owner.

Levenson's Mine (Hydraulic).—It is 1 mile S.E. from Fairplay, at 3,050′ elevation, and comprises 60 acres. The gravel bank is 50′ deep, with 6′ of soil capping. The cut is 250′ long and 60′ wide; half an acre of ground was removed the past season; several acres have been removed through another cut on the opposite side of the gravel ridge. The bowlders have to be removed by blasting. The gold is coarse. The water is obtained from the Empire Ditch Co., and 150 miner's inches are used for piping, etc., delivered through 600′ of 11″ and 7″ pipe, under 75′ pressure, to one giant with 3½″ nozzle. The sluices are 120′ long, set on an 8″ grade and furnished with pole riffles. The water season is continuous. On the south side of the ridge a tunnel, 150′ long, has been driven to the edge of the gravel, proving the channel to be the same width. Six men are employed. Levenson Bros., of Fairplay, owners.

Linden Mine (Drift).—See our VIIIth and XIIth Reports, pp. 196 and 115. It is 1 mile E. of Placerville, at 2,025′ elevation, and comprises three claims, designated *Cedar Springs*, *Globe*, and *Linden*. It employs 25 men when running the mill, 10 stamps of 450 lbs. each, which crushes from 60 to 80 tons of gravel daily through a No. 16 wire screen. An incorporated company of Boston, Mass., owner. In the hands of a receiver. John Rowland, of Placerville, foreman.

Lincoln Mine (Seam Diggings).—It is 1¼ miles N.W. from Georgetown, at 2,350′ elevation, and comprises 20 acres. This seam belt strikes N. and S., is 300′ wide, and is worked through a 100′ cut and three tunnels, 150′, 60′, and 110′ long. Water for washing is obtained from Oregon Cañon, through 600′ of 12″x14″ flume, with 1″ grade per foot. One hundred miner's inches are delivered through 800′ of 15″ and 11″ pipe to a 2½″ nozzle; the water season lasting nine months. The dump is into Oregon Cañon, through two strings of 20″ sluices, 900′ in total length, on 12″ grade per box. Two men are employed. M. D. Haskins, of Georgetown, owner.

Live Oak Mine (Quartz).—It is 3 miles S. of Placerville, at 1,775′ elevation. It adjoins the Larkin on the S. and the Griffith Consolidated on the N., and is on the same vein, which courses N. and S., and dips E. The outcrop is 30′ wide in places. There is a 30′ shaft on the claim. Not working at date. An incorporated company, owner; D. H. Jackson, of Placerville, manager.

Log Cabin (*Darrow*) *Mine* (Quartz).—See our XIIth Report, p. 116. It is in Sec. 30, T. 9 N., R. 10 E., about 5 miles S.E. of Shingle Springs, at 900′ elevation. The vein strikes N.W. and S.E., and dips 65° N., between serpentine and slate walls, and is from 2′ to 16′ wide; the quartz makes in bunches between the walls. The vein is worked through a 200′ tunnel and 350′ of drifts along the vein, giving 100′ of backs. Near the tunnel is a 30′ shaft. A length of about 80′ has been stoped above the tunnel. About 1½ miner's inches of water issues from the tunnel. The 5-stamp water-power mill, with 900-lb. stamps, is run at a speed of 100 drops per minute, dropping 5½″, giving a capacity of 15 tons per day. The Diamond Ridge Ditch Co. supplies 33 miner's inches of water, delivered, through 350′ of 11″ pipe, on a 4½′ Knight wheel. Six men are employed at the mine. A. Darrow, of Shingle Springs, owner.

Lone Jack Mine (Quartz).—See our Xth Report, p. 176. It is 1 mile N.W. of Garden Valley and 1 mile S. of the Idlewild Mine. After a season of rest, work has been resumed by a Los Angeles company. N. D. Burlingame, superintendent.

Lone Star Mine (Quartz).—See our XIIth Report, p. 116. It is on Mathenas Creek, 6 miles S. of Placerville, at 1,700′ elevation. The vein, with a width varying from 2′ to 5′, strikes slightly E. of N., and lies between slate and greenstone. A tunnel is being driven to tap an old shaft, and was 200′ long in June last. Two men are at work. Col. D. H. Jackson, of Placerville, superintendent.

Lone Star Mine (Quartz).—See our XIIth Report, p. 116. It is 1¼ miles S. of Nashville, at 900′ elevation. Idle. J. C. Heald, of Nashville, owner.

Lookout and K.K. Mines (Quartz).—They are in Quartz Cañon, 1 mile S. of Volcanoville, at 2,900′ elevation, and comprise two claims worked in conjunction. The Lookout vein strikes N. and S., and dips E; the K.K. strikes N.E., with heavy croppings, 20′ to 30′ wide, inclosed in slate; the vein of the Lookout varies from a seam to 12″ wide, between porphyry and slate walls, finally running into the slate entirely. The developments on the Lookout consist of a tunnel, 200′ long, cross-cutting the porphyry to the vein and turned both N. and S., some 40′ to 50′, showing the vein broken up. A 3′x 4′ incline on 55° slope has also been sunk 34′, and drifting commenced from the bottom. One man is at work. Wilson Cary, of Georgetown, owner.

Lucinda Mine (Quartz).—It is on Wisconsin Gulch, near the North Fork of the Cosumnes River, 3 miles W. from Grizzly Flat, at 2,875′ elevation. The 6″ to 3′ vein strikes E. and W., and dips 70° N., between granite and slate walls. The developments are carried on through a 50′ perpendicular shaft and a 150′ cross-cut to the vein. Idle. Mrs. Nail and D. Gallagher, of Grizzly Flat, owners.

Lucky Marion (*Shepherd*) *Mine* (Quartz).—It is ½ mile W. of Greenwood, at 1,830′ elevation, and comprises 73 acres. The vein strikes N. 30° W., and dips 56° N.E., between serpentine hanging-wall and slate footwall, 31′ apart, and includes a talcose schist casing. The main 3½′x 5½′ incline is 107′ deep, and is timbered with 6″x 8″ posts and 6″x 10″ caps, and closely lagged with 3″ planking. At 85′ it cuts through a greenish quartz stringer, 18″ to 24″ wide, carrying coarse gold, resting along a gray quartzitic rock, which carries 2% of gold-bearing pyrite of a high grade. The shaft has a steam hoist, capable of raising 1,000 lbs. and skip from a 500′ depth. A 60-gal. Hooker sinking and a 30-gal. Dean pump, with a 25 H.P. boiler, complete the outfit. Seven men are employed. An incorporated company, No. 619 St. Charles Street, St. Louis, Mo., owner; J. W. Nier, of Greenwood, manager.

Mammoth Mine (Quartz).—It is 8 miles N.W. of Shingle Springs, at 1,100′ elevation, and comprises 22½ acres. The vein, from 3′ to 4′ wide, strikes N.E. and S.W., and dips W., in grano-diorite. A pay-shoot has been traced along 200′ of the surface, carrying 1½% to 2% sulphurets, but the general appearance of the vein is "hungry" looking. A 10-stamp mill placed near Weber Creek, run by water-power, belongs to the mine; it has free water from Weber Creek through ¾ mile of ditch, using 200 miner's inches under 42′ head. Temporarily idle. Jaspar Jurgens, of Lotus, owner.

Manzanita Queen (Quartz).—See our VIIIth and Xth Reports, pp. 189 and 172. It is 1½ miles S.E. of Diamond Springs. A 2-stamp Briggs mill has been crushing, it is said, 8 tons of quartz per day. It is run by a 3′ Knight wheel under 280′ head, with 18 miner's inches of water from the Diamond Ridge Ditch Co. Below the mill is a Seymour's centrifugal concentrator. Since our last Report the tunnels and shafts have been extended. Eight men are employed. C. F. Bryant et al., of Diamond Springs, owners.

Mathenas Creek (*Schneider*) *Mine* (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 190, 172, and 117. It is 2 miles S. of Diamond Springs. Idle. Sacramento Development Co., owner; R. T. Morrison, of El Dorado, manager.

McCall Gravel Mine (Drift).—See our XIIth Report, p. 116, and also Channel Bend Mine.

McNulty (*Oakland*) *Mine* (Quartz).—See our XIIth Report, p. 117. Dismantled. J. B. Drury, of St. Louis, Mo., owner.

Melton Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 177 and 117. It is 2½ miles N.E. of Grizzly Flat. Idle. A Cleveland, Ohio, company, owner.

Miller (*Ribbon Rock*) *Mine* (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 189, 177, and 117 and 122. It is 2½ miles S. of Placerville, and adjoins the Superior Mine. Idle. Moses Miller, of Placerville, owner.

Mississippi Mine (Drift).—See our XIIth Report, p. 117. It is 1½ miles E. of Volcanoville. Idle. C. F. Lloyd, of Georgetown, owner.

Molkey Mine (Hydraulic).—It is 1 mile S.E. from Fairplay, at 2,870′ elevation, and comprises 160 acres. The course of the main channel is N.E., running apparently with the ridge and under it; the present bank in the cut is on an outbreak from the channel proper. The gravel lies both above and below a 10′ strata of pipe-clay, on granite bedrock, and is capped with 4′ of soil; it contains lava bowlders and considerable clay, and carries coarse gold. Water is brought from Slug Gulch, in the Hale ditch, which has been leased; it is 16 miles long, and carries 400 miner's inches of water, which is delivered under 200′ pressure, through 1,200′ of 11″ and 7″ pipe, to one monitor, using 1½″ and 3″ nozzles. The water season lasts six months. The tail flume is 150′ long, 22″ wide, and supplied with pole riffles; it dumps into Stoner Creek, where there are two restraining dams, 12′ high, built of logs. Eight men are employed. J. D. Spreckels, of San Francisco, and S. Molkey, of Napa, owners; S. Loveless, of Fairplay, superintendent.

Montana Mine (Quartz).—It is in Quartz Cañon, 1 mile S. of Volcanoville, at 2,680′ elevation. The vein strikes N. and S., dips 50° E., and has a width of 14′ between porphyry and slate walls. It is being developed through an incline 45′ deep, as well as by a tunnel 50′ long, which will cut the vein in 20′ more. A small Kendall, 1-stamp mill, 900 lbs. weight, run by a gasoline-engine, is placed near the mouth of the tunnel for prospecting. Six men are employed. J. Helmers et al., of Georgetown, owners.

Montezuma Mine (Quartz).—See our XIIth Report, p. 118. It is ½ mile N. of Nashville. Idle. J. C. Heald, of Nashville, owner.

Mooney Mine (Drift).—See our XIIth Report, p. 118. It is 8 miles E. of Placerville, on an ancient lava-capped channel. — Mooney, of Fyffe, owner.

Morey Mine (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 178, 178, and 118. It is 1 mile W. of Grizzly Flat, and adjoins the famous Mount Pleasant on the north. It is said that a San Francisco company is about to develop it. Idle. E. R. Morey, of Grizzly Flat, owner.

Mount Gregory Mine (Hydraulic).—It is 3 miles E. of Volcanoville, at 3,200′ elevation, and comprises 160 acres, on the white gravel channel. The gravel bank is from 20′ to 25′ high, with 8′ of gravel carrying considerable clay and cement capping. About ¼ acre has been worked the past season, the bowlders being blasted. About 190 inches of water is taken from the Daggett ditch and delivered, under 95′ pressure, through 300′ of 15″ and 7″ pipe to a No. 1 giant with a 3″ nozzle. The water season lasts four to five months. Two strings, 60′ and 26′ long, of 28″ flume are used, dumping into Missouri Cañon behind two restraining dams, 60′ long, built of logs and brush. Four men are employed. A. Phelps and — Porter, of Georgetown, owners.

Mount Hope Mine (Quartz).—See our VIIIth Report, p. 178. It is on the south bank of the North Fork of the Cosumnes River, 3 miles N. of Grizzly Flat. Opened by tunnels. Mine and 10-stamp water-power mill idle. A Cleveland, Ohio, company, owner.

Mount Pleasant Mine (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 178, 178, and 118. It is ¾ mile W. of Grizzly Flat. Idle. J. D. Hague et al., of New York, owners.

Murzo (*Brass'*) *Mine* (Drift).—See our XIIth Report, p. 119. It is on Buckeye Hill, 2 miles from Volcanoville. A. E. Brass, of Georgetown, owner.

Nashville (*Havilah or Hendy*) *Mine* (Quartz).—See our XIIth Report, p. 119. It is at Nashville, at 850′ elevation. Since our last Report the mine has been reopened to the 650′ level, and some stoping done between fifth and sixth levels, but is again closed temporarily. A new 20-stamp steam-power mill has been built and is well supplied with gold-saving apparatus. The Diamond Ridge Ditch Co. is about to extend its lines 10 miles, and will furnish water, under 650′ pressure, for the hoisting works and mill. Judge George E. Williams, of San Francisco, owner.

New El Dorado Mine (Quartz).—See our XIIth Report, p. 119. It is 2½ miles N.E. of Greenwood. Idle. W. N. Martin, of Oakland, Alameda County, owner.

New Garibaldi Mine (Quartz).—It is 2½ miles W. of Greenwood, at 1,975′ elevation. The vein, averaging 8′ in width, strikes N.W. and S.E., and dips E., between slate walls. The developments consist of a 170′ tunnel, to cut the vein, besides five shallow shafts along the outcrop, not over 40′ deep. When the tunnel reaches the vein it will give 230′ of backs. The quartz is of a rotten character, and the pay-shoot has been proved to be 400′ or more in length. A Kinkaid mill of 25 tons capacity, to be run by steam-power, will be placed below the mouth of the tunnel. Four men are employed. J. W. Scott, of Los Angeles, and J. T. Smith, of Greenwood, owners.

Oak Mine (Quartz).—See our XIIth Report, p. 119. It is 5 miles S.W. of Grizzly Flat. Idle. J. Ryan, of Grizzly Flat, owner.

Ohio Mine (Quartz).—It is 1 mile E. of Greenwood, at 1,950′ elevation. The vein strikes N. of W., and dips 51° N., between slate walls. In an open cut on the cropping, extending over 100′, three other quartz stringers were cut; 75′ distant was stringer No. 1, 18′ beyond was No. 2, and 20′ farther, No. 3 was cut. In sinking the 4′x 6′ main working-incline, which had reached a depth of 150′ in June last, it was started on the pitch of the foot-wall of the main vein, but in keeping this pitch, passed entirely into the hanging-wall, so that at 100′ depth, where the shaft cut stringer No. 1, the foot-wall is 35′ distant, and at 125′, where stringer No. 2 was encountered, it is 45′ to the foot-wall. The shaft is being continued to a depth of 250′. Where the stringers were encountered they had increased from mere stringers to 3′ and 4½′ in width. The quartz carries 1½% of a good grade of sulphurets, and frequently shows free gold. The hoisting is done by a 15 H.P. engine, and the water is handled with buckets, 6 per hour. Six men are employed. An incorporated company, of San Francisco, owner; C. Kinney, of Greenwood, superintendent.

Ohio Mine (Quartz).—See our XIIth Report, p. 119. It is 1 mile S.W. of Grizzly Flat. Idle.

Old Jasper Mine (Quartz).—It is 9 miles N.W. from Shingle Springs, at 1,100′ elevation, and comprises 80 acres, under agricultural patent. There are two parallel veins, 3′ to 4′ wide, with a N. and S. strike in grano-diorite. On the bank of Weber Creek a tunnel has been driven 200′ on the vein and stoped out to the surface, and an incline started from the surface through the old works. The mine is under bond, and idle at present. J. Jurgens, of Lotus, owner.

Omo Mine (Quartz).—It is 8 miles E. of Fairplay, at 3,440′ elevation, and comprises 60 acres. The vein strikes N. and S., and at the surface dips W., but turns E. in depth. The formation is grano-diorite, and the vein is from 18″ to 30″ wide. The surface on the outcrop is being piped off and is proving remunerative in quartz gold. The quartz carries 1% sulphurets. There is a 150′ tunnel and a 64′ shaft. Water is supplied from the Empire Ditch Co., through 230′ of 7″ pipe under 100′ pressure, using 50 miner's inches, at a cost of 5 cents per inch. The 16″ flume is 125′ long, set on a ½″ grade to the foot, and is preceded by a rock cut on a 10″ to 12″ grade, and lined with pole riffles. Two men are at work. G. W. Mock, of Omo Ranch, owner.

Oregon Mine (Quartz).—See our VIIIth Report, p. 182. Adjoins the Rose, in the southern part of Placerville. See Placerville Gold Quartz Mining Co.

Oro Fino Mine (Quartz).—See Big Cañon.

Pacific Mine (Seam Diggings).—See our XIIth Report, p. 120. It is on Cañon Creek, at 2,600′ elevation, and comprises between 6 and 7 acres. Worked by blasting down to the bank and washing the rocks, using water from North Cañon Creek, through ¾ mile of ditch. Four men are employed. Barklage Estate et al., of Georgetown, owners.

Pacific Mine (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 183, 173, and 120. It is developed to a depth of 1,000′, and a large ledge of $2 quartz exposed. Idle. See Placerville Gold Quartz Mining Co.

Padre Mine (Quartz).—See our XIIth Report, p. 120. It is 2½ miles N. from Nashville. Idle. J. M. Vandergrift, of Nashville, owner.

Payne Gravel Mine (Drift).—See our XIIth Report, p. 120. It is 3 miles S. of Grizzly Flat. Idle. J. M. McClean, of Grizzly Flat, owner.

Philadelphia and Gold Note Mines (Quartz).—See our XIIth Report, p. 120. They are in T. 8 N., R. 13 E., 8 miles S. of Grizzly Flat, at 3,760′ elevation, and comprise four claims, designated the *Gold Note*, *Philadelphia*, *Whitehall*, and *Woolara;* two are 1,500′ by 600′, and the other two are 1,400′ by 600′. Since our last Report the second shaft on the Philadelphia has been sunk to a depth of 125′ to connect with the tunnel, while on the Gold Note the shaft has been sunk to a depth of 145′ and a drift run 340′ on the vein; also, a 10′ cross-cut made. The vein in this drift shows 5′ wide. A sawmill of 10,000 ft. B.M. capacity per day has been erected, and a 4″ Cornish jackhead pump placed in the Gold Note shaft, to run with either steam or water power. There is a 6′ Pelton wheel, using 40 miner's inches of water, under 320′ head, delivered through 1,700′ of 11″ and 7″ pipe-line. The steam hoist is 60 H.P. The changes in the 10-stamp mill are confined to the introduction of movable aprons. The shaft will be straightened and sunk 150′ to 200′ farther, and drifts run by Septimus Mining Co., which is working it under bond. Nine men are employed. J. B. Polk and Parker Bros., of Omo Ranch, owners; R. S. Raw, of Placerville, superintendent.

>*Pine Hill Gold and Silver Mining Co.'s* (*Unity*) *Mine* (Quartz).—See our XIIth Report, p. 121. It is 5 miles N.W. from Shingle Springs, at 1,060′ elevation, and comprises 3,000′ by 300′. The vein strikes N. and S., dips W. near the surface, but turns in depth to 70° E. The walls are slate and greenstone, and 20′ apart, carrying 6′ of quartz. There is a 4′x 10′ double-compartment shaft, 100′ on incline, then 100′ perpendicular. At the 200′ level, drifts extend 125′ E. and 60′ W. from the shaft, and a cross-cut 140′ northward. The plant consists of a steam hoist and 4″ Dow plunger pump, with 2″ discharge pipe. Eight men are employed. An incorporated company, of No. 1021 Tenth Street, San Francisco, owner; C. Milly, manager.

Placerville Gold Quartz Mining Co.'s Mines (Quartz, Hydraulic, and Drift).—The quartz mines extend from a mile S. of the American River almost continuously to Weber Creek, a distance of 3 or more miles. The following are the principal ones: *Black Bear*, *Brown Bear*, *Chester*, *Cinnamon Bear*, *Epley*, *Faraday*, *Gross*, *Henrietta*, *Ida*, *Keegan*, *Mammoth*, *Old Harmon, Oregon, Oregon Extension, Pacific, Rose, True, Van Hooker, White Bear, Young Harmon*, etc. They are supposed to be all on the Mother Lode belt. Besides, the company owns hydraulic mines in Chili Ravine, on Spanish and Nigger hills, White Rock, etc.; also, drift mines on Cedar Ravine, etc. It also owns the El Dorado Water and Deep Gravel Mining Co.'s ditch system. All the mines have been idle for the past three or four years. The company is an English one. A. D. Henderson, of Placerville, superintendent.

Plattsburg Mine (Quartz and Placer).—It is ¾ mile N. of Georgetown, at 2,700′ elevation, and comprises 22 acres. The vein strikes N. and S., dips 65° E., and is from 1′ to 4′ wide, between slate and porphyry walls. The quartz carries coarse free gold, with a few sulphurets. This is a new discovery, showing two pay-shoots on the surface, 200′ and 70′ long, respectively. Besides the quartz, there are 7 acres of gravel on the Mameluke channel, carrying nugget gold, the largest piece found weighing $427. Two men are employed opening the claim. A. J. & R. S. Wilton, of Georgetown, owners.

Pleasant Valley Mine (Quartz).—It is ½ mile E. of Pleasant Valley. Developed by 480′ of tunnel and two shafts, 80′ and 140′ deep. Idle. H. S. Morey, of Placerville, owner.

Pocahontas Mine (Quartz).—It is 2½ miles S. of El Dorado, at 1,700′ elevation, and comprises 6,000′ by 800′ of mining ground, besides 350 acres of land. The vein strikes N. of W., and dips 38° E. There are two veins, 300′ apart, designated the *Empire* and the *Pocahontas*, both dipping E.; the former at the steeper angle. The formation is quartz porphyry on the surface, but at a depth of 495′, slate is encountered. The *Pocahontas* vein is from 4′ to 9′ wide, the *Empire* 20″. The quartz in the depth carries 2% to 3% sulphurets. At 5′ x 12′ three-compartment incline shaft is 300′ deep; at present partially filled with water; two vertical shafts with double compartments are respectively 400′ and 135′ deep. A steam hoist will soon be placed on the three-compartment shaft, and a temporary pump, of 10,000 gals. per hour capacity, to be replaced later by a Cornish jackhead pump. A tramway, 700′ long, leads to a 5′ Huntington steam-power roller mill furnished with two Seymour concentrators. Seven men are employed. An incorporated company, of No. 35 Wall Street, N. Y., owner; James Richards, of El Dorado, superintendent.

Pyramid Mine (Quartz).—See our XIIth Report, p. 121. It is 4 miles N.W. of Shingle Springs, at 1,100′ elevation, and comprises 30 acres. The vein strikes N. 20° W., and dips 40° E. Near the north end of the claim a second vein joins the former at an acute angle. There is a pronounced pyramid-shaped outcrop to the vein from 18′ to 30′ across, which is furnishing a portion of the milling ore. The pay-shoot has been proved 500′ in length, carrying 1½% to 2% sulphurets. On the mill level a tunnel has been driven on the vein 100′ below the outcrop, the back portion of which has caved; the front 150′ are connected by a chute with the croppings, down which the ore is passed to the mill. On the north end of the claim is a vertical 6′x 15′ three-compartment shaft, now 50′ deep, from which a cross-cut is started. It is supplied with a horse-whim, which is to be discarded for a large steam hoist. The 5-stamp water-power mill, with 550-lb. stamps, is run at 105 drops of 6″, crushing 8 tons per day. The water is taken from Dry and Indian creeks, through 1 mile of ditch of 100 miner's inches capacity, and delivered to a 4′ Knight wheel under 40′ head. Six men are employed.

Pyramid Mine and Milling Co., owner; L. J. Gilman, of Shingle Springs, superintendent.

Quartz Cañon Mine (Placer).—It is in Quartz Cañon, 1¼ miles from Volcanoville, at 2,680′ elevation. The cañon is being worked for the quartz debris by the use of a "self-shooting" reservoir, which receives 300 miner's inches from the Daggett ditch, filling the reservoir in ¾ hour and emptying in three minutes. The cut is worked from 30′ to 40′ wide, and in the deepest portion the bank is 30′ high. The bowlders are blasted. No sluice-boxes are used, the bed of the cut being lined with poles for 200′ in length. The water season lasts six months. Four men are at work. J. Helmers et al., of Georgetown, owners.

Rainbow (*Wild West*) *Mine* (Quartz).—It is 1¼ miles N.W. from Garden Valley, at 2,220′ elevation. The vein strikes N. and S., and dips 45° E., between a porphyry hanging-wall and a slate foot-wall, with a width of 23′ of vein matter, only 6′ of which, next the hanging-wall, pays to extract. An open cut of 300′ has been run on the outcrop of the vein, and a 4′x8′ double-compartment shaft started, which was in June last 25′ deep. A small 4-stamp prospecting mill, with 500-lb. stamps, is on the property, driven by a 5′ wheel with Pelton buckets, taking 15 inches of water from the California Ditch Co., and delivered under 101′ pressure, through 260′ of 9″ and 5″ pipe. Five men are employed. J. Ramsdell and C. M. Root, of Garden Valley, owners.

Rattler Mine (Quartz).—See our XIIth Report, p. 122. It is on the south side of Weber Creek, 2½ miles S. of Placerville. Only assessment work. John Dench and James Keyser, of Placerville, owners.

Red Rover Gold Mine (Quartz).—See our XIIth Report, p. 122. It is 3 miles S. of El Dorado and a little E. of Logtown. Idle. E. Harper et al., of El Dorado, owners.

Ribbon Rock Mine (Quartz).—See Miller.

Rocky Bar Mine (Quartz).—See our XIIth Report, p. 122. It is ½ mile E. of Greenwood. Assessment work only. S. Kaiser, of Greenwood, owner.

Roscoe Mine (Quartz).—It is 3 miles N.E. from Latrobe, at 900′ elevation. This is an old mine which is being prospected with a core drill machine, prior to reopening. The revolving tubular drill is operated by steam, using for cutting, chilled steel shot of the size of bird-shot. They are charged through the water about once an hour and fall to the bottom of the drill. To date the bore-hole was 190′ deep; the first 40′ down to solid rock being cased with 5″ iron pipe. The formation is greenstone and slate. The object of the drill-hole is to prove if the vein, which dips W. on the surface, reverses the dip below. The vein strikes N. and S., and dips W.; the former workings showing a 12′ vein. The present rate of drilling, employing 4 men, is from 4′ to 5′ per day only. Senator J. P. Jones, of Nevada, owner.

Rose Mine (Quartz).—See our VIIIth Report, p. 182. It is in Placerville. See Placerville Gold Quartz Mining Co.

Rosencranz Mine (Quartz).—See our VIIIth and Xth Reports, pp. 171 and 176. It adjoins the Taylor or Idlewild Mine on the south, and it is reported that the pay-shoot from the latter enters the Rosencranz ground at the 500′ level. There is an old steam hoist and 10-stamp mill on the property. After several years of litigation the State Supreme Court has decided that the owners are H. S. Morey and Richard Rowland, of Placerville, and Rinaldo Fillipini, of Garden Valley.

Rubicon Mine (Drift).—It is 2½ miles W. of Volcanoville, at 3,100′ elevation. It was formerly worked as a hydraulic mine, but during the past season a tunnel was started in bedrock and driven 110′, till it pitched away, beginning 85′ from the mouth. Some breasting has been done on soft gravel, 4′ high and 27′ wide. One hundred inches of free water for washing is obtained from Missouri Cañon, which is delivered through ½ mile of ditch and 1,700′ of 22″ pipe, under 40′ pressure. The 12″x 16″ flume is about 400′ in length. Three men are employed. — Barklage et al., of Georgetown, owners.

St. Lawrence Mine (Quartz).—See our XIth Report, p. 202. It is 1 mile N. of Kelsey. It was worked years ago to a depth of 700′, where the ledge faulted. Formerly had a steam hoist and a 20-stamp mill. Under bond to a Milwaukee incorporated company, which is sinking a new shaft by steam-power. Mierson & Alderson, of Placerville, owners; Edward Bind, superintendent.

Salisbury Mine (Quartz).—It is 5 miles E. of Placerville, at 2,100′ elevation; it comprises 259 acres, and adjoins the Grand Victory on the west. The vein strikes N.E. and S.W., and dips 70° E. It has but recently been opened; the outcrop of the ore-body is being stripped for milling, while a double-compartment incline shaft is being sunk at an angle of 80° E., which had reached 40′ depth in June. A mill, containing a Gates crusher, two 5′ Huntington mills, and a Seymour centrifugal concentrator, calculated for 40 tons capacity per day, has been erected adjacent to the hoisting works, the whole plant being run by steam. Fifteen men are employed. Salisbury Mining Co., owner; Monroe Salisbury, manager.

San Martine Mine (Quartz).—It is 1¼ miles N.W. of Greenwood, at 1,900′ elevation. The 20′ vein strikes N.W. and S.E., and dips 60° N.E., between a greenstone foot-wall and a slate hanging-wall. While the main vein is apparently barren, the black slate hanging-wall carries rich seams and veinlets of quartz, and the slate itself is well mineralized. The outcrop is being sluiced off, and an 80′ tunnel has been driven on a side vein. The California Ditch Co. supplies 50 miner's inches of water for sluicing. Two hundred feet of 20″ flume, set on an 18″ grade per 12′, are used. Two men are employed. Ed. Hummel, of Greenwood, owner.

Santa Rosa Mining Claim (Drift).—It is in T. 18 N., R. 11 E., 1½ miles E. of Volcanoville, at 3,200′ elevation, and comprises 300 acres on the blue channel, which has a N.E. and S.W. course and is lava-capped, extending 1 mile across from rim to rim on the surface. A tunnel is being driven through the rim on south side of ridge, which at present has reached 718′ in length, and will require to be extended 400′ to 500′ to reach the gravel channel. Formerly the workings were along the east rim. The gold is variable in character. Wash water is supplied from the tunnel and neighboring springs. The mine is temporarily closed. An incorporated company, of Santa Rosa, Sonoma County, owner; A. J. Wilton, of Georgetown, superintendent.

Schneider Mine (Quartz).—See Mathenas Creek.

Sharp Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 194 and 123. It is 5 miles E. of Placerville, at 2,400′ elevation. Mine and 10-stamp steam-power mill are idle.

Snow Bros.' Mine (Hydraulic).—It is 1½ miles N.E. from Newtown and 8 miles E. of Placerville, at 2,500′ elevation, and comprises 600 acres, held partly under agricultural patent. The gravel is cemented and worked from two different pits, about ½ mile apart. The upper one is 40′ deep, with from 10′ to 20′ of gravel, capped with loam; the second pit has a 200′ face, 25′ high, capped with cement and lava, with 5′ of gravel on the bedrock. The gold is coarser in the second pit, but not quite as high grade as in the upper one. The bowlders are removed by blasting. The gravel should be milled. During the last season, extending over six months, an acre of ground has been worked. Water is obtained from the El Dorado Water and Deep Gravel Mining Co., and is delivered through two pipe-lines, 2,500′ and 2,000′ long, under 250′ pressure, to the giants. The 2′ flumes in the upper pit have a length of 1,200′ in two sections; the first with a grade of 10″ per 16′ box, the second on a 16″ grade to 16′ box; both paved with 8″ block riffles. The grade of the two sections in the lower pit flumes is 6″ to 16′ box. Their length is 100′ and 300′, respectively. The dump is into Weber Creek behind a log and brush dam 225′ long and 30′ high. Five men are employed. It is reported that an Eastern company has purchased it. Snow Bros., of Newtown, owners.

Slager Mine (Quartz).—See our XIIth Report, p. 123. It is 4 miles N. of Greenwood. Idle. John Wade et al., of Oakland, owners.

South Extension of Ohio Mine (Quartz).—It is 1½ miles E. of Greenwood, at 1,900′ elevation. The vein strikes E. and W., and dips 50° N., between slate walls. Operations have only recently been started, comprising to date a 100′ tunnel, which will require to be extended 200′ farther to reach the vein; a stringer of quartz has been passed through. Two men are at work. W. Board, of Greenwood, owner.

Spanish Mine (Hydraulic).—See our XIIth Report, p. 123. It is ½ mile N.W. of Greenwood, on the "seam diggings" belt. Idle. M. M. Howe, of Greenwood, owner.

Springfield (*Church Union*) *Mine* (Quartz).—See our VIth Report (Part II), p. 43. It is 3 miles S. from El Dorado, at 1,180′ elevation, comprising three claims. The two veins, the *Church Union* and the *Cosumnes*, strike N. and S., and dip 80° E., and average 4′ to 10′ between slate walls. After a period of idleness, pay-ore was found near the west side of the claim, and a new 5′x 8′ shaft has been started on the east or Cosumnes vein, and provided with a small steam hoist. In June last the shaft had attained a depth of 40′, where a drift was being run on the pay-shoot. A Kinkaid mill was erected, and run a short time with water obtained from the Diamond Ridge Ditch Co. A 20-stamp mill is to be substituted for it immediately. Ten men are employed. Union Gold Mining Co., owner; A. Harpending, of El Dorado, manager.

Standard Mine (Quartz).—See our XIIth Report, p. 123. It is across the American River from, and ½ mile N. of, Coloma. G. Schulz et al., of Coloma, owners.

Starlight Mine (Quartz).—See our XIIth Report, p. 123. It is 2½ miles S. of El Dorado, at 1,720′ elevation, and comprises two claims. The vein strikes a little W. of N., dips 40° E., and is about 3′ wide. A 10-stamp steam-power mill has been erected this summer, the steam hoist put in good condition, and a branch of the Diamond Ridge Ditch Co.'s system extended to the mine, to furnish battery and boiler water. Two men are at work. Starlight Mining Co., of No. 206 Sansome Street, San Francisco, owner; A. Blanc, of El Dorado, superintendent.

Stewart Mine (Drift).—See our Xth and XIIth Reports, pp. 180 and 123. It is 1½ miles S.E. of Placerville. The mill has been moved to Grizzly Flat. Idle. John Melton, of Placerville, owner.

Stillwagon (*St. Lawrence*) *Mine* (Quartz).—See our Xth and XIIth Reports, pp. 179 and 123. It is 7 miles E. of Fairplay, at 2,900′ elevation, and comprises two claims, designated the *Golden Link* and the *Stillwagon.* Since our last Report a tunnel has been started on the Golden Link ground. Three men are employed. S. A. Laine, of Omo, owner.

Stuckslager (*Sam Sim's*) *Mine* (Quartz).—See our VIth and XIIth Reports, pp. 43 and 124. It is on Granite Creek, 1 mile S. of Lotus, at 825′ elevation. The vein strikes N. 54° W., and dips 77° S., crossing the formations of greenstone, porphyry, and clay slate, while serpentine lies to the N.W. The quartz varies from a seam to 2′ in thickness, and carries, along the walls and seams, pockets of gold in connection with *roscoelite*, a mineral of rare occurrence. In the vein proper the quartz does not average over $2 per ton. Since our last Report, new parties have taken hold of the property, under bond, and a shaft has been sunk 80′ below the main tunnel, 286′ from the mouth, following the hanging-wall. A small steam hoist and a Worthington duplex pump have been installed, and some stoping done near the upper portion of the shaft. The main tunnel has also been extended to 426′ in length, the breast being 127′ perpendicularly below the outcrop. The rich *roscoelite* is worked in a hand-mortar. Ten men are employed. W. B. McKinney and C. H. Grube, of Lotus, owners; W. E. Everson, of Lotus, superintendent.

Studhorse Mine (Quartz).—It is 2 miles W. of Greenwood, at 2,000′ elevation. The vein strikes E. and W., and dips 30° N., between slate walls 9′ apart. The quartz shows free gold, and carries 1½% of sulphurets of good grade. There are two shallow shafts, 30′ and 40′ deep, sunk on the vein. Two men are at work. J. T. Smith and J. C. Shepard, of Greenwood, owners.

Sugarloaf (*Monarch*, *Hermitage*) *Mine* (Quartz).—See our XIIth Report, p. 124. It is 2½ miles N.W. of Nashville, at 1,550′ elevation. The vein strikes N. and S., and dips slightly E., between greenstone and slate walls, carrying 5′ of quartz. The present workings consist of a 60′ tunnel and a 270′ shaft, supplied with steam hoist and pump, in the nature of prospect work. A very large pocket of gold was taken out the past year. Two men are employed. Dr. A. C. Smith, of Portland, owner.

Sunday Mine (Quartz).—See our XIIth Report, p. 124. It is 1½ miles W. of Grizzly Flat. Assessment work only. Mrs. M. Jeffrey et al., of Grizzly Flat, owners.

Sunrise Mine (Quartz).—It is 1 mile N.E. of Kelsey, at 2,000′ elevation, and comprises 153 acres, with 160 acres of timber land, railroad title. There are three parallel veins on the property, one of which is largely composed of spar. They strike N. and S., and dip E.; No. 1 is 9′; No. 2, the spar vein, is 30′; and No. 3 is 15′ thick; all three are cut by a tunnel, 320′ long, which turns both ways on No. 3 a short distance. The country rock is slate, with steatite next to the spar vein. The entire depth on the vein gained by the tunnel is only 35′. On No. 3 vein a shaft has been started on the north end of the claim and is now 40′ down, while on No. 1 a 50′ shaft is on the south end of the claim. This vein is supposed to be the same as the Dalmatia. From the main tunnel a tramway, 620′ long, connects with a 10-stamp water-power mill, with 800-lb. stamps, which is idle at present. The mill is furnished water from the California Water Co., through 200′ of 11″ pipe, and delivered to a 5′ Pelton wheel. A water-right on Rock Creek belongs to the mine, and it is intended to utilize it to generate electric power and bring it 1½ miles to the mill. Two men are at work. S. F. Woodward, of Clipper Gap, Placer County, owner.

Superior (*Tin-cup*) *Mine* (Quartz).—See our VIIIth and Xth Reports, pp. 187 and 172. It is 3 miles S. of Placerville. It is provided with a steam hoist and a 10-stamp water-power mill, deriving water, through 5,400′ of 11″ pipe, from the Diamond Ridge Ditch Co. Idle. W. H. Martin, Crocker Building, San Francisco, owner.

Tapioca Mine (Quartz).—It is 2 miles S. of Grizzly Flat, at 3,570′ elevation. The vein strikes N. 6° E., and dips W., but it is broken over on top; the formation is porphyry and mica schist, and the vein makes 6′ in width. The developments are made through tunnels, the longest being 200′ to the vein, and drifted 10′ thereon. On about the same level is a second tunnel 70′ long. A water-right belonging to the property takes water from Steeley's Fork of the Cosumnes River, through 1½ miles of ditch, 3½′ wide on top, 2½′ deep, 18″ wide at bottom, with a grade of 16′ per mile, and of 400 miner's inches capacity, which furnishes 80′ pressure on the ground. Two men are at work. J. H. Barker, C. H. Stout, and G. W. Stout, of Grizzly Flat, owners.

Taylor Mine (Quartz).—See Idlewild.

Texas Hill Mine (Drift).—See our XIIth Report, p. 124. It is 2½ miles E. of Placerville, and belongs to the Placerville Gold Quartz Mining Co. Idle.

Toll House Mining Co.'s Mine (Drift).—See our Xth Report, p. 179. It is at Smith's Flat, 2½ miles E. of Placerville, and is east of and upon the same channel as the Benfeldt. It has been worked intermittently during past few years by a Cleveland, Ohio, company, which has erected a water-power hoist and sunk a shaft. W. P. Stanley, of Placerville, superintendent.

Treat Mine (Quartz).—See our VIIIth Report, p. 178. It is 2½ miles N. of Grizzly Flat, at 3,400′ elevation. It is an old property being reopened; the vein strikes N. and S., and dips W., in grano-diorite. The old tunnels are being cleaned out prior to further exploiting. Mrs. John D. Treat, of Oakland, owner.

Trench Mine (Quartz).—See our XIIth Report, p. 125. Idle. Heirs of J. Trench, of New York, owners.

True Consolidated Mining Co.'s Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 180 and 125. It is 1 mile N. of Placerville. Mine and 10-stamp water-power mill idle. John Melton, agent.

Try Again (*Last Chance*) *Mine* (Drift).—It is 3½ miles E. of Placerville, in Sec. 15, T. 10 N., R. 11 E., at an elevation of 2,100′, and comprises 400 acres, on the same channel as the Linden and Tokey mines. A drift has been run 1,500′ N. of E., in the bedrock, connected at the 1,000′ station with the surface, 213′ above, by an upraise through bedrock and lava. Usually 4 men are at work; temporarily idle. Charles Varozza, of Placerville, owner.

Tullis (*Diamond*) *Mine* (Quartz).—It is 2¼ miles S. from Diamond Springs, at 1,645′ elevation. The vein strikes N. and S., and dips 30° E., between quartz porphyry walls, 2½′ apart. From the 4½′x 5′ double-compartment incline, 200′ deep, drifts have been run 125′ south and 50′ north. The south drift connects with the old stopes. The hoisting is done by horse-whim. Four men are employed. An incorporated company of San Leandro, Alameda County, owner; C. H. Hart, secretary; D. W. C. Morgan, of El Dorado, manager.

Two Channel Mine (Hydraulic and Drift).—It is 8 miles N.E. of Georgetown, at 3,200′ elevation, on the Tiederman portion of the property, and comprises 1,100 acres of ground, including the *Kentucky Flat, Kenna and Morgan Consolidated, Norris or Kates, Tiederman, Wilton,* and other claims, extending north to Mount Gregory, a distance of 4 miles. Through this ground two channels have been followed, crossing each other on an acute angle at different elevations; they are distinguished as the *white* and the *black* or *blue* channels. The former has a N. and S. course, corresponding to the Michigan Bluff channel, while the latter is considered as a portion of the Breece & Wheeler channel, both of which are on the Forest Hill Divide, Placer County. The former is distinguished from the latter by the absence of any lava bowlders. There are two pits, about 2 miles apart, one on the Tiederman and the other on the Kentucky Flat; the former, worked during the past season, is about 300′ square, bank 20′ high, with 10′ of gravel and lava capping, the gravel being somewhat cemented. The gravel is two thirds bowlders, which are removed by blasting. Two tunnels are being run in the bedrock in the former pit, 6′ high, 3½′ cap, and 6′ spread, carrying 4′ in the bedrock. A No. 3 giant takes water from the California Ditch Co., through 650′ of 11″ pipe, under 150′ pressure. On the Kentucky Flat ground, the hydraulic pit is on the white channel, 2½ acres in extent, with a 25′ bank, carrying from 2′ to 6′ of gravel. Four hundred miner's inches are used here under 170′ pressure. There is a 700′ tunnel also in this portion of the ground. Between the preceding claims is the George Wilton, or Middle Otter Creek claim, where a couple of small pits have been opened on the white channel, but which are not being worked at present. The bank here is shallow and will be piped later. On the Kenna and Morgan Consolidated claims both channels are developed through hydraulic pits on the white channel, and drifts on the black or blue channel. The main drift is 700′ long, 6½′ high, 3½′ cap, and carried 4′ in bedrock. The breasts are carried 60′ wide and 3½′ high, and both posts and caps, as well as sets, are employed in timbering; the breasters average 3 tons per shift. The gravel from this drift is cemented, and is crushed in a 10-stamp water-power mill, with 550-lb. stamps, having a capacity of 60 tons per day, using No. 12 wire screen. The water is applied to a 6′ Dodd wheel through a 7″ pipe under 300′ pressure. On the Norris claim an old tunnel is being repaired to reach the black channel. Four miles of graded roads and telephone lines connect the claims. The gold from both claims is coarse. About 40 men are employed. D. W. Marmon, of Indianapolis, Ind., H. E. Picket, of Placerville, et al., owners; D. W. Green, of Georgetown, superintendent.

Uncle Sam Mine (Drift).—It is 2½ miles S.E. of Fairplay, at 2,760′ elevation, and comprises 40 acres on an ancient channel. There are two tunnels; the upper one 120′ to gravel, thence 58′ where the bedrock pitched away on an angle of 26°, and thence 44′ on the slope. A second tunnel was then started 100′ perpendicularly below in the granite bedrock, and is now 227′ long, and will have to be extended 135′ to reach the gravel. Six men are employed. An incorporated company, owner; F. Hyde, secretary; R. D. Waggoner, of Uno, superintendent.

Unity Mining Co.'s Mine (Drift).—See our XIIth Report, p. 125. It is 3 miles N.E. of Placerville. Dismantled. Geo. W. Kimble et al., of Placerville, owners.

Uno Mining Co.'s Mine (Drift).—It is in T. 8 N., R. 12 E., 3 miles S. of Fairplay, at 2,770′ elevation, and comprises 40 acres on an ancient channel. The main gangway is 350′ long, partly in granite and partly in gravel; there is also a 50′ drift and an upraise. The rims of the channel are from 1,500′ to 1 mile apart. Idle. Willard Gardner, of Sacramento, owner.

Valdora Mine (Quartz).—See our VIIIth Report, p. 178. It is ½ mile W. of Grizzly Flat, and adjoins the Mount Pleasant on the south. Idle.

Van Hooker Mine (Quartz).—See our VIIIth Report, p. 181. Also see Placerville Gold Quartz Mining Co.

Vann Mine (Quartz).—It is ¾ mile N. from Georgetown, at about 2,700′ elevation. Idle. W. D. English and B. Baldwin, of San Francisco, owners.

Vulture Mine (Quartz).—It is ¾ mile N.E. of Placerville, at about 2,050′ elevation. It is prospected by a 72′ shaft, connecting at a point 50′ from the surface with a 127′ tunnel. A second tunnel, 52′ lower than the other, is being driven on a porphyry belt, and is now 150′ long. Very rich gold quartz specimens and tellurides are found in it. W. A. Craddock et al., of Placerville, owners.

Webster Mine (Quartz).—See our XIIth Report, p. 126. It is in Quartz Cañon, 2½ miles N.E. of Georgetown. Idle. D. C. Webster, of Georgetown, owner.

Welch Gold Mine (Quartz).—See our XIIth Report, p. 126. It is ½ mile N.E. of Greenwood. Recently a San Francisco company bonded it, sunk 100′, cross-cutted 150′, and erected a water-power hoist. It is said most satisfactory developments were made, revealing a ledge 3′ to 8′ wide. H. Welch, of Greenwood, owner.

White Bear (Quartz).—See our VIIIth Report, p. 182. See Placerville Gold Quartz Mining Co.

Wild West Mine (Quartz).—See Rainbow.

Wilton Mine (Drift).—See Two Channel.

Woodside Mine (Quartz).—See our XIIth Report, p. 126. It is in Georgetown. C. M. Fitzgerald, of Georgetown, owner.

W. W. Mine (Drift).—See our XIIth Report, p. 126. It is on Cement Hill, 4 miles N. of Georgetown. Idle. R. S. Wilton, of Georgetown, owner.

Zentgraf Mine (Quartz).—See our VIIIth Report, p. 200. It is 8 miles E. of Newcastle, Placer County, close to the American River, at 450′ elevation, and comprises two mining claims and 111 acres. The vein strikes N.W. and S.E., and dips 40° to 48° S.W., through a granodiorite formation into slate, and increases in width from 12″ on the surface to 3′ in the lower workings. The quartz carries 1¾% of iron sulphurets, with some galena. The mine is worked through a 4′ x 9′ double-compartment incline, 530′ deep. A self-dumping skip, of 1-ton capacity, raises the rock on a 37″ track to a grizzly with 1½″ spaces, which delivers it to a Dodge rockbreaker of 12 tons per hour capacity; the skip is also used for handling the water. A 9″ x 12″ steam-engine of 35 H.P. runs the hoist. An adit, 500′ long, which was the former working outlet, taps the incline at the 300′ level and turns a distance of 1,280′ on the vein; from this level to the surface the ground is pretty well stoped. The next level below, No. 2, or the 400′ level, has drifts extending 291′ N. and 295′ S. on the vein. On No. 3, or 500′ level, drifts run 225′ N. and 295′ S. The principal stations in the mine, as well as all the buildings, are lighted by electricity, using a dynamo with a capacity of 250 lights of 16 candle-power. The mill is in the immediate vicinity of the hoist, and the entire work from the time the ore leaves the skip is by gravity. The 20-stamp mill carries 1,000-lb. stamps, making 95 drops per minute of 4½″, with 4″ discharge through a 30-mesh screen of punched tin, giving a capacity of 80 tons per day. Suspended Challenge feeders, operated below the lower guide from the center stamp, without a bumper rod, and fed automatically through chutes from the ore-bin, are used. The apron plates are 5′ wide, 20′ long, and are set on a grade of 1¾″ to the foot. The concentration is effected with four Woodbury concentrators, 6′ wide and 9′ long. The mill is further provided with an iron clean-up barrel, and an assaying and melting department. The power is furnished by a 12″ x 30″ Corliss engine of 70 H.P. An automatic tailings-sampler, similar to that in use at the Idlewild (see illustration, p. 146), is employed. The entire mill plant and the method of working may be taken as a standard model of the best California mill practice. There are 80 men employed, 40 of whom are in the mine. E. W. Chapman, of Greenwood, owner; T. T. Chapman, of Newcastle, Placer County, superintendent.

MILLS IN EL DORADO COUNTY.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of Each, in Lbs.	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
					No.	Character.	No.	Capacity.		
Alpine	Water	10	1,000	35	3	Duncan				
Aultman	"	10	850	16						
Baltic*	"	10								
Big Cañon	"	30	1,200	70	6 3	Frue Tulloch	1	5 tons.		
Big Jim	Steam	2	850	10	1	Johnson				
Big Sandy	Water	10	750							
Blue Bank	"	2	250	1						
Boulder	"	10								
California Jack	"	10	1,000	15						
Chili Ravine	"	10	550	60–70						
Church	"	10	950	24	4	Frue				
Crystal	"	8	650							
Crystal	"	10	650							
Daily & Bishop	"	10	750		2	Gold Bug Chief				
Dalmatia*	Electric	10	850							
Darling	Steam	10			2	Frue				
Davidson	"	20								
Eagle King	Water	10	650	16						
Esperanza	"	20								
Eureka	"	10								
Flagstaff	"	10								
Fort Yuma	"	10								
Franklin	"	10	600	60						
French Hill	"	10	750							
Gentle Annie	"	10	750	20	2	Frue				
Gopher Boulder*	"	20	750		8	Frue				
Grand Victory	"	50	1,000	100	9 5	Frue Triumph	1	3 tons.		
Griffith & Bryant	"	5	350							
Havilah	Steam	20	1,000	60	6	Hendy				
Idlewild*	Water	40	950	110						
Josephine	"	20	750–850	50	8	Triumph				
Lady Emma	"	10	850		2	Frue	(One	Gold King	Amalgamator.)	
Larkin	Steam	5								

MILLS IN EL DORADO COUNTY—Continued.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of Each, in Lbs.	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
					No.	Character.	No.	Capacity.		
Last Chance	Water	4	550	4						
Linden	"	10	500	60-80						
Log Cabin	"	5	900	15						
Mammoth	"	10	750							
Manzanita Queen	"	2		8		Seymore				
Melton	Steam	20			8	Frue				
Montana*	"	1	900	3						
Montezuma	Water	10	650							
Morey	"	5	600							
Mount Pleasant	Steam	10			4	Frue				
Oak	Water	5	800							
Oregon	"	10	750	15	4	Frue				
Pacific	"	20	800	30						
Padre	"	5	650							
Philadelphia and Gold Note	"	10	650	8						
Pocahontas*	Steam	10								
Pyramid	Water	5	550	8						
Rainbow	"	4	500	20						
Rosencranz	Steam	10	800							
Rogers Gravel	Water	10	500	130						
Sharp	Steam	10								
Starlight	"	10								
Stillwagon	Water	5	850	10	1	Woodbury				
Superior	"	10	750	22	4	Frue				
Sunrise	"	10	800							
Texas Hill	"	10	750	60						
True	"	10								
Two Channel	"	10	550	40						
Unity	"	10	375							
Zentgraf	Steam	20	1,000	80						

In addition to stamps, the mills marked with a * have additional capacity, as follows:

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN EL DORADO COUNTY.

Name of Mill or Mine.	Power.	Number	Character.	Diameter	Capacity per 24 Hrs., in Tons.
Baltic	Water		Cannon Ball		3
Dalmatia	Electric	1	Huntington	5′	
Gopher Boulder	Water	2	Huntington	5′	
Hardscratch	"		Dyer Cannon Ball		4
Idlewild	"		Dodge		25
Lone Star	Steam		Huntington	5′	
Mathines Creek	Water		Huntington	5′	9–10
Montana	"		Kendall		
New Garibaldi	Steam		Kinkead		25
Pocahontas	"		Huntington	5′	15
Salisbury	"	2	Huntington	5′	40
Shaw	Water		Huntington	5′	10–12
Springfield	"	1	Kinkead	5′	10

Fresno County.

The principal revenue of the county is derived from its agricultural, viticultural, horticultural, and stock-raising interests. Fruit of all kinds, and particularly grapes, are produced in immense quantities. The arid climate necessitates an artificial water-supply, and extensive irrigation systems and innumerable artesian and pumped wells are the result; on the other hand, it facilitates the quick drying of fruit, so that it has made the county the center of the raisin industry of the State. Mining of the precious metals is carried on to some extent in the foothills of the Sierra Nevada, while coal of good quality, gypsum, and petroleum are produced in the Coast Range. The recent oil developments seem especially promising. Mineral springs also occur, but are only slightly improved. The lumber industry is of considerable importance, the total output for 1895 amounting to 41,000,000 ft. B.M., 40% of which was sugar pine, and the rest yellow pine and spruce. It is brought from the mountains in V flumes with 3′ sides, set on grades of not less than 110′ per mile. The Kings River Flume Co. has a flume 49½ miles long, and the Fresno Flume and Irrigation Co. has one 41 miles long. Their combined product in 1895 runs up to 36,000,000 ft. B.M. of lumber.

Barnes Mine (Quartz).—See our XIIth Report, p. 127. It lies on Big Creek, 5½ miles S.E. of Pine Ridge, at 4,450′ altitude. Idle. G. W. Barnes, of Pine Ridge, owner.

B. & M. Mine (Quartz).—It is on Dinkey Creek, 10 miles E. of Pine Ridge, at 5,620′ altitude. The 2′ vein occurs in granite, and dips 30° N.E. A tunnel 75′ long has been driven on the vein. The ore is free-milling, and is treated in a horse-power arrastra. James Bridgers, of Pine Ridge, owner.

Big Bar Mine (Placer).—This lies on Dinkey Creek, 10 miles E. of Pine Ridge, at 5,300′ altitude. Water for ground-sluicing is taken from Dinkey Creek by a short ditch. The gravel is 8′ deep. Mort. Howell, of Pine Ridge, owner.

Big Sampson Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 207 and 127. It is situated 1 mile W. of Sampson Flat. Idle. Estate of B. H. Sterns, of Visalia, Tulare County, owner.

Black Jack Mine (Quartz).—See our XIIth Report, p. 127. It is 1 mile W. of Sampson Flat, and on the same vein as the Big Sampson. Idle. A. Hammersley, of Bakersfield, Kern County, owner.

Blue Rock Mine (Quartz).—See our XIIth Report, p. 127. It is on Keyes Creek, 3 miles N.E. of Letcher, at 1,500′ altitude. The vein is 2′ thick, courses S.E. and N.W., and dips between vertical granite walls. The development consists of four shafts, 25′ to 118′ deep. Mrs. S. Craig, of Letcher, owner.

Boyd & Slater Mine (Placer).—See our XIIth Report, p. 127. It is on Mill Creek, 5 miles N.E. of Dunlap, at 2,500′ altitude. The creek furnishes water for ground-sluicing. Boyd & Slater, of Dunlap, owners.

Campbell Mine (Placer).—It lies on San Joaquin River, 1 mile above Pollasky, at 475′ elevation, and contains 20 acres. Water for sluicing is taken from the river. James Campbell, of Pollasky, owner.

Champion Mine (Quartz).—See our XIIth Report, p. 128. It is on Keyes Creek, 2 miles S.E. of Letcher, at 1,200′ altitude. F. Gross, of Letcher, owner.

Confidence Mine (Quartz).—See our XIIth Report, p. 128. It is on Keyes Creek, 2 miles S.E. of Letcher, at 665′ elevation. The vein is 1½′ to 4′ wide, and dips 85° E., between walls of mica slate. Considerable pay-rock has been taken from this vein in former years. It is practically idle at present. A 5-stamp water-power mill, with 650-lb. stamps, belongs to the property. E. Loyd, of Letcher, owner.

Crystal (Weatherby) Mine (Quartz).—See our XIIth Report, p. 131. It is in Auberry Valley, 2½ miles N. of Auberry, at 1,580′ altitude. Idle. Logan Baird et al., of Garfield, owners.

Crystal Springs Mine (Quartz).—See our XIIth Report, p. 128. It is on Keyes Creek, 2 miles S.E. of Letcher, at 1,400′ elevation. The vein is 2′ wide, and dips 70° N.E., between granite walls. The development consists of a 110′ tunnel along the vein, which contains some 2% of sulphurets. Jos. Vernette, of Letcher, owner.

Defiance Mine (Quartz).—See our XIIth Report, p. 128. It is on Keyes Creek, 2 miles S.E. of Letcher, at 1,250′ altitude. The main tunnel has been extended 50′, and is now 310′ long. The vein averages 14″ of quartz, and stands nearly vertical. The country rock is granite. F. Gross, of Letcher, owner.

Dennis Mine (Placer).—It is on Big Creek, 6 miles E. of Pine Ridge, at 4,580′ altitude, and contains 20 acres. Water for sluicing is brought from Big Creek by a 2′ wide ditch, ¼ mile long. The bank is 12′ high and all gravel. Jim Dennis, of Pine Ridge, owner.

Emma (Yorton) Mine (Quartz).—See our XIIth Report, p. 128. It is on Dog Creek, 5 miles S.E. of Letcher, at 1,600′ altitude. Idle. Hugh Nipper et al., of Letcher, owners.

Flinn Mine (Placer).—It lies on Dinkey Creek, 10 miles E. of Pine Ridge, at 5,620′ elevation. Worked by ground-sluicing. James Flinn, of Pine Ridge, owner.

Gilkie Mine (Placer).—See our XIIth Report, p. 128. It is at Sampson Flat, at 2,650′ elevation. Worked by ground-sluicing. S. C. Moore, of Dunlap, owner.

Grubstake Mine (Quartz).—See our XIIth Report, p. 128. It is on Dog Creek, 5 miles S.E. of Letcher, at 1,580′ altitude. The vein consists of 14″ of quartz, in thin seams and hornblende schist, dipping 60° E., between syenite walls. Developed by a 30′ shaft. Taylor Young et al., of Letcher, owners.

Hancock Mine (Placer).—It is on Big Creek, 6 miles E. of Pine Ridge, at 5,200′ altitude, and contains 20 acres. Water for sluicing is brought from the creek by a 2′ wide ditch, ¼ mile long. The gravel is 12′ deep. Ben Hancock, of Pine Ridge, owner.

Hancock Mine (Quartz).—See our XIIth Report, p. 129. It lies on Big Creek, 6 miles E. of Pine Ridge, at 5,400′ elevation. The vein contains from 6″ to 2′ of gold quartz, free from sulphurets. It dips 60° N.E., between granite walls. The lower tunnel is 460′ long, and is being extended. The ore is treated in a water-power roller mill of 2 tons daily capacity. A. Halk, of Pine Ridge, owner.

Henrietta Mine (Quartz).—See our XIIth Report, p. 129. It is at Temperance Flat, 6 miles N. of Auberry, at 1,260′ elevation. The property embraces three locations: the *Henrietta*, *Hidden Treasure*, and *St. John*. In the latter are three tunnels on the vein, 100′ to 150′ long. The lowest one is being extended on the vein. The quartz is 2″ to 12″ thick, and dips 45° N. The country rock is a coarse, crumbly granite. In the Hidden Treasure is an incline shaft, 70′ deep, and a tunnel to meet it, 80′ long; both on a vein, 6″ to 12″ wide, running parallel with the Henrietta vein. A 2-stamp steam-power mill is on the ground, ready to set up. S. C. St. John and John Albin, of Fresno, owners; J. B. Summers, of Auberry, superintendent.

Hercules Mine (Quartz).—See our XIIth Report, p. 128. It is at Sampson Flat, at 2,700′ altitude. The tunnel has been extended some 60′, and the ground above stoped. S. C. Moore, of Dunlap, owner.

Hidden Treasure Mine (Quartz).—See Henrietta.

Homestake Mine (Placer).—See our XIIth Report, p. 129. It is at Sampson Flat, at 2,650′ elevation. A bed of gravel, 2′ to 8′ thick, on the second bench, is being sluiced. J. N. Albin, of Fresno, owner.

Howell's Mine (Hydraulic).—It is on Laurel Creek, 12 miles E. of Pine Ridge, at 5,450′ altitude. A 2′x 2′ ditch, 3 miles long, conveys water from Laurel Creek, and delivers it, through 250′ of 7″ hose, to a 2″ nozzle, under 60′ pressure. The sluices are 24″ wide, and are supplied with Hungarian riffles. The bank of gravel is 8′ deep. Russell & Howell, of Pine Ridge, owners.

Huron Mine (Quartz).—See our XIth and XIIth Reports, pp. 215 and 128. It is in Auberry Valley, 1½ miles W. of Auberry, at 1,300′ altitude. The mine is abandoned and the mill and plant removed.

Inyo Mine (Quartz).—See our XIIth Report, p. 129. It is on Temperance Flat, 5 miles N.E. of Auberry, at 775′ elevation. Little work has been done in the mine since our last Report. At the end of the 400′ tunnel an upraise has been made to the next one above. The vein, 6″ to 3′ thick, consists of crushed quartz mixed with talc. The dip is 25° N.W., and the walls granite. A 1-stamp steam mill on the claim crushes about 1 ton per day, using a 60-mesh wire screen. No provision is made to save the 10% of sulphurets contained in the ore. J. S. Johnson, of Visalia, Tulare County, and Mrs. H. Sullivan, of Auberry, owners.

Keno Mine (Quartz).—See our XIIth Report, p. 129. It is on Temperance Flat, 5½ miles N.E. of Auberry, at 1,200′ altitude. Some prospecting is being done to find a new ore-shoot. Fresno Mining and Milling Co., owner; Harry Sherwood, of Fresno, superintendent.

Kipp Mine (Placer).—It is on Dinkey Creek, 10 miles E. of Pine Ridge, at 5,750′ altitude. Water from Dinkey Creek is taken through a mile of 2′ ditch and 150′ of 4″ canvas hose to a 1½″ nozzle, under 70′ pressure. The sluices are 12″x 12″, and paved with block riffles. The bank has 3′ to 9′ of gravel, mixed with many large bowlders. W. J. Kipp, of Toll House, owner.

Lemmon Mine (Placer).—See our XIIth Report, p. 129. It lies on Stevenson Creek, 7 miles N.E. of Pine Ridge, at 5,700′ altitude, and contains 20 acres. Idle. D. M. Lemmon, of North Fork, Madera County, owner.

Little Monitor Mine (Quartz).—See our XIIth Report, p. 129. It is at Davis Flat, 2½ miles N.E. of Sampson Flat, at 2,900′ altitude. Idle. S. C. Moore, of Dunlap, owner.

Lockwood Mine (Placer).—It lies on Mill Creek, 2½ miles E. of Dunlap, at 2,200′ altitude, and contains 20 acres. J. M. Lockwood, of Dunlap, owner.

M. A. B. Mine (Quartz).—It is on Temperance Flat, 5 miles N.E. of Auberry, at 700′ altitude, and adjoins the Post Oak. The vein is 6″ thick, dips 60° E., between granite walls. Development consists of two tunnels, 70′ and 80′ long. R. L. Welch, of Auberry, owner.

McDonald Mine (Quartz).—See our XIIth Report, p. 129. It is on Big Creek, 5½ miles S.E. of Pine Ridge, at 4,460′ elevation. Idle. J. W. McDonald, of Fresno, owner.

Mersaba Mine (Placer).—See Ohio.

Missouri Mine (Placer).—It lies on San Joaquin River, at Pollasky, at 460′ altitude, and contains 20 acres. A bed of gravel, 10′ deep, lying in an old channel a few feet above high-water mark, is being sluiced out. J. T. Parker, of Pollasky, owner.

Moore Mine (Quartz).—It is on Hughes Creek, 15 miles E. of Sanger, at 1,800′ altitude. The vein contains 2′ of quartz, with few sulphurets. It strikes N. and S., and dips vertically between syenite walls. Idle. Vincent Moore, of Sanger, owner.

Mount Stirling Mine (Quartz).—See our XIIth Report, p. 130. It lies on Dog Creek, 5 miles S.E. of Letcher, at 1,560′ altitude. M. V. Ashbrook, of Letcher, owner.

Ninety-Nine Mine (Quartz).—See our XIIth Report, p. 130. It lies ½ mile N.W. of Dunlap, at 2,600′ elevation. J. W. Howell, of Dunlap, owner.

Nob Hill Mine (Quartz).—It is in Auberry Valley, 2½ miles N. of Auberry, at 1,460′ elevation. The vein occurs in granite, and contains 8″ of free milling-quartz, and dips 30° N.E. The mine is worked through a 450′ tunnel on the vein, and several winzes, 50′ deep, below it. An air shaft is being sunk to meet the end of the tunnel. A 5-stamp mill, using 650-lb. stamps and No. 9 slot screens, stands near the mouth of the tunnel. It is driven by a 16 H.P. engine, and has a capacity of 14 tons per day. Cavin & Hall, of Auberry, owners.

Ohio (Mersaba) Mines (Placer).—See our XIIth Report, p. 130. The property consists of several thousand feet of placer ground along the San Joaquin River, below the mouth of Fine Gold Creek. A dam was completed across the San Joaquin River, about 150′ above the mouth of Fine Gold Creek, in December, 1895, and the river turned into the canal cut for the purpose on the left bank. It was intended to employ pumps to raise water from the basin-like depressions on bedrock not drained naturally when the river was turned. These pumps were to be operated by a large undershot wheel placed across the canal. The wheel was so arranged that it could be raised or lowered to suit the flow of water passing through the canal. Ohio-Mersaba Mining Co., of Fresno, owner.

Oro Fino, Nos. 1 and 2, Mines (Quartz and Placer).—See our VIIIth and

XIIth Reports, pp. 207 and 130. They lie at Davis Flat, 2 miles N. of Sampson Flat, and are worked at present by ground-sluicing. A. P. Davis, of Traver, Tulare County, owner.

Parker Mine (Placer).—It is on San Joaquin River, at Pollasky, at 450′ altitude, and contains 20 acres. An old channel, with 10′ of gravel, is worked by ground-sluicing. W. H. Parker, of Pollasky, owner.

Peck Mine (Placer).—It lies on Dry Creek, 1½ miles below Toll House, at 1,650′ elevation. It is worked by ground-sluicing, water being obtained from a small gulch by a short ditch. John Peck, of Toll House, owner.

Petrea Mine (Quartz).—See our XIIth Report, p. 130. It is on Little Dry Creek, 4 miles S.W. of Toll House. A. W. Petrea, of Toll House, owner.

Post Oak Mine (Quartz).—It lies on Temperance Flat, 5 miles N.E. of Auberry, at 690′ elevation. The vein is 6″ wide, dips 60° E., in granite. It is developed by a tunnel 60′ long. R. L. Welch, of Auberry, owner.

Protection Mine (Quartz).—See our XIIth Report, p. 130. It is on Temperance Flat, 5 miles N.E. of Auberry, at 800′ altitude. Idle. J. Hoxey and W. A. Sheppard, of Fresno, owners.

Providence Mine (Quartz).—See our XIIth Report, p. 130. It is on Dinkey Creek, 10 miles E. of Pine Ridge, at 5,000′ altitude. The vein occurs in granite, dips 50° N.E., and averages 2′ in width. The ore-shoot having been lost, a drift, 280′ long, has been run along the vein from the bottom of the 200′ shaft to prospect the claim. A 10-stamp water-power mill, using 750-lb. stamps, crushes the ore. Logan, Beard & Nelson, of Pine Ridge, lessees.

Quien Sabe Mine (Quartz).—See our XIIth Report, p. 130. It is 1½ miles W. of Temperance Flat, at 1,260′ altitude. The vein is 2′ wide, and dips 30° N.W., in granite walls. The rock contains 6% sulphurets. Development consists of three shafts, 40′, 40′, and 80′ deep, and a 600′ tunnel on the vein. Idle. D. H. Jackson, of Oakland, Alameda County, owner.

Rabado Mine (Placer).—It is on Bear Creek, 10 miles E. of Pine Ridge, at 8,000′ altitude. Worked by ground-sluicing. Luis Rabado, of Pine Ridge, owner.

Rattlesnake Mine (Quartz).—See our VIIIth Report, p. 215. It lies 1 mile W. of Temperance Flat, at 1,300′ elevation. Idle. D. H. Jackson, of Oakland, Alameda County, owner.

Rip van Winkle Mine (Quartz).—It is on Dog Creek, 3 miles S.E. of Letcher, at 1,560′ elevation. The vein averages 12″ thick, stands vertically, and strikes S.E. and N.W. It is worked through a 300′ tunnel, with a 50′ winze at its end. The country rock is granite. McCall Bros., of Letcher, owners.

St. John Mine (Quartz).—See Henrietta.

Sawyer & Murray Mine (Placer).—See our XIIth Report, p. 130. It lies on Mill Creek, 5 miles N.E. of Dunlap, at 2,640′ altitude. Worked by ground-sluicing. Sawyer & Murray, of Dunlap, owners.

Slocum Mine (Quartz).—See our XIIth Report, p. 130. It is on Big Pine Creek, 4½ miles E. of Pine Ridge, at 4,400′ altitude. The vein is 5″ to 2′ wide, and lies in granite, on a dip of 36° N.E. Development consists of three tunnels 40′, 50′, and 200′ long. Charles Slocum, of Reedley, owner.

Smuggle Mine (Quartz).—See Sunol.

Sullenger Mine (Quartz and Placer).—It lies on Dinkey Creek, 10 miles E. of Pine Ridge, at 5,750′ altitude. The 8″ vein dips 35° N.E., between granite walls. The ore is a soft, talcose, ocherous material. A tunnel, 150′ long, is driven on the vein, and the ore is treated in a water-power arrastra. Below the vein placer operations are carried on. A mile of 2′ ditch brings water from Dinkey Creek. There is 175′ of 4″ hose, with 1½″ nozzle, under 70′ pressure; 100′ of 12″x 12″ sluices with pole riffles. Richard Sullenger, of Pine Ridge, owner.

Sunol (*Smuggle*) *Mine* (Quartz).—See our XIIth Report, p. 130. It is on Temperance Flat, 5 miles N.E. of Auberry, at 700′ altitude. R. L. Welch, of Auberry, owner.

Temperance Mine (Quartz).—It is on Temperance Flat, 5 miles N.E. of Auberry, at 760′ altitude. It is an extension of the Inyo Mine. The vein is 12″ wide, dips 30° N.W., between granite walls, and consists of quartz, with few sulphurets. There are two tunnels, 100′ long, and a shaft 50′ deep on the vein. W. W. Alderman, of Auberry, owner.

Thorn Mine (Quartz).—See our XIIth Report, p. 131. It is on Keyes Creek, 3 miles S.E. of Letcher, at 1,320′ altitude. The vein occurs in granite, is 18″ thick, and dips 75° N.E. The development consists of three tunnels, 70′, 80′, and 200′ long, and a shaft 200′ deep. The ore is free-milling, containing few sulphurets. Idle. T. Waxford, of Sentinel, owner.

Thornton Mine (Hydraulic and Drift).—See our XIIth Report, p. 131. It is on San Joaquin River, 6 miles above Pollasky, at 550′ elevation, and contains 120 acres. A new plant is being erected to raise water, for hydraulicking, to the ditch 200′ above, by a centrifugal pump, driven by a breast wheel in the river. The ditch is 1′x 1′, and 800′ long. The pressure obtainable is about 110′, and an 8″ pipe and No. 1 giant will be used. The gravel lies in an old channel 70′ above the river, and is from 10′ to 25′ deep. A drift is being run to strike the bedrock in the lowest place. In April, 1896, it was 110′ long, and cut through slide material with many large bowlders. Jeff Donahue Mining Co., of Pollasky, owner.

Thornton Mine (Placer).—It is on Temperance Flat, 5 miles N.E. of Auberry, at 760′ altitude, and contains 20 acres. The material is 1′ to 4′ deep, and consists of float and debris from the Inyo Mine. Water for sluicing is obtained from the lower tunnel of the Keno Mine. D. M. Thornton, of Auberry, owner.

Wakefield Mine (Placer).—See our XIIth Report, p. 131. It is on Laurel Creek, 6 miles E. of Pine Ridge, at 5,450′ altitude. Water is taken from Laurel Creek through a short, small ditch. The plant consists of 200′ of 4″ canvas hose with 1½″ nozzle, under 60′ pressure, and 150′ of 12″x 12″ sluices, with block riffles. The gravel is from 3′ to 16′ deep. W. Wakefield, of Toll House, owner.

Weatherby Mine (Quartz).—See Crystal.

Weimuth Mine (Placer).—It is on Little Dry Creek, 4 miles S. of Letcher, at 1,600′ elevation. A 3′ bed of calcareous cement is being sluiced. A. Weimuth, of Letcher, owner.

White Cross Mine (Quartz).—See our XIIth Report, p. 131. It is at Dunlap, at 2,800′ altitude. Idle. Clark Moore et al., of Dunlap, owners.

White Mule Mine (Quartz).—It lies on Temperance Flat, 5 miles N.E. of Auberry, at 740′ elevation. The vein is 6″ thick, courses N. and S., and stands nearly vertically between walls of crumbly granite. There is a shaft 70′ deep, with short drifts both ways. R. H. Whittaker, of Auberry, owner.

MILLS IN FRESNO COUNTY.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of Each, in Lbs.	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
					No.	Character.	No.	Capacity.		
Abbey	Steam	10	800	25	4	Frue				
Confidence	Water	5	600	5						
Hanover	Steam	5	850	6⅕	1	Frue				
Henrietta		2	600	3						
Inyo		1	600	1						
Josephine	Steam	20	900	50	8	Frue				
Keno		5	650							
Last Chance	Steam	10	900	11¼	2	Frue				
Nob Hill		5	650	14						
Providence	Steam	10	640	12						

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN FRESNO COUNTY.

Name of Mill or Mine.	Power.	Number	Character.	Diameter	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Plant, Size.
						No.	Character.	No.	Capacity.		
B. & M.			Arrastra		1¼						
Hancock			Rocker		2						
Sampson	Steam		Kendall		8						
Sullenger			Arrastra		1						

Humboldt County.

This county adjoins Del Norte on the south. It extends about 150 miles along the seacoast, and is traversed by the mountains of the Coast Range. The principal industries are lumbering, dairying, and sheep-raising. The county ranks first in the State as a producer of redwood lumber and shingles; the redwood tree attaining a larger size here than elsewhere in the State. The product of butter shipped from Eureka to San Francisco during 1895 averaged 20,000 lbs. weekly. Hydraulic mining is prosecuted on the benches and bars of the Trinity and Klamath rivers, and beach mining at Gold Bluff and elsewhere along the coast. No quartz mine of importance has yet been developed in the county.

Anderson Mine (Hydraulic).—It embraces 160 acres on the Trinity River, opposite China Flat, at 400′ altitude above sea-level. Water is obtained from Bremer Gulch through a 3′x 2′ ditch, 2 miles long, and delivered through 400′ of 6″ pipe to a No. 1 giant, working under 80′ pressure. The bank is 15′ high, and all gravel. Idle. Harry Close, of Eureka, owner.

Beach Mining.—In many places along the coast auriferous black sands are found, and in Del Norte and Humboldt counties they have been worked with success. In the latter county, beach mining is being prosecuted between Klamath and Little rivers, and considerable gold is secured annually. The most important patch of pay-sand is found between Amany and Redwood creeks, 6 miles S. of Klamath River. It is 41½ miles long, and embraces five claims, as follows: *Johnston*, *Lower Gold Bluff*, or *Union*, *Ramona*, *Upper Gold Bluff*, or *Pioneer*, and *Swan*. Farther south pay-sand occurs at Stone Lagoon, Big Lagoon, and Little River. The bluffs between Amany and Butler creeks, a distance of 3 miles, consist of black carbonaceous metamorphic shale, containing calcite in blotches and streaks, and quartz in short veinlets. Here and there bunches and specks of pyrite are visible. Resting on the shale, which is about 500′ thick, is gravel, and it extends to the top of the mountain, some 2,000′ above sea-level. Immediately below Butler Creek the black shale disappears below the surface, and on it lies a bed of very crumbly gray sandstone, 150′ to 200′ thick, a vein of lignite, 6″ thick, and soft gray clay shale, 80′ thick. The whole dips 80° S. Nonconformably upon these beds lies the gravel, dipping 15° S. for a short distance, and then assuming a horizontal position. Near the bottom it is slightly cemented, while higher up it is not. The gravel bluffs stand nearly perpendicularly, and are from 100′ to 175′ high. Going south along the beach, 1½ miles, the bluffs gradually change. The gravel becomes finer, and the percentage of sand increases. Bands of soft gray sandstone appear, and grow thicker as we go south. Above the buildings of the Pioneer Mine a section shows from the bottom upwards, as follows:

Gravel, slightly cemented	10′
Very soft blue sandstone	15′
Gravel, slightly cemented	30′
Very soft blue sandstone	10′
Small gravel and sand	85′

The bluff maintains the same character 3½ miles down the coast, to a small lagoon, where the works of the Union Mine are located. Below the lagoon, for ¾ mile, the bottom stratum of clay shale is visible, carrying here and there pieces of lignite and nodules of limonite. The bluffs are low, 10′ to 60′, and dip 20° S.W., or into the ocean. Immediately south of this the hills are broken away altogether, for a distance of 500′, by a small stream, and here a mass of serpentine crops out. From this point to Redwood Creek the hillside consists of serpentine and the same black metamorphic shale mentioned before. The gold found on the beach is derived, no doubt, from the gravel, and possibly also from quartz and pyrite in the black shale. As the breakers undermine the bluffs large masses break down and are disintegrated by the surf. The action of the waves during a strong wind differs at times, for no apparent reason. Sometimes after a storm the beach is narrow and steep, and at other times it is piled up with sand, several hundred feet wide. The ordinary surf, when the wind blows diagonally against the shore, has a panning action on the sand, taking away the lighter particles and leaving black sand and gold. Years ago the beach along the whole of the gold bluffs was narrow and steep, and the waves washed their base at every high tide. At present this is only the case at the south end. On the northern part, for a distance of 3 miles, sand has accumulated to a width of 200′ to 800′, and, besides, a broad sandbar is forming about a mile from shore. This deposit of sand has been noticed to grow for the last ten years. The material is no doubt brought down the Klamath River and carried south by the strong ocean current. The action is visible from the mountain tops, the yellow water from the Klamath and the blue of the sea being easily discernible. Mining the beach sand is done by collecting the black sand from the beach after the tide has gone out and washing it in ordinary and patent "toms," constructed as described hereafter.

Big Lagoon Mine (Beach).—See our XIth Report, p. 230. It is 9 miles N. of Trinidad, and embraces 20 acres. Big Lagoon is a bay, 40′ deep, 4 square miles in area, and separated from the ocean by a sand dune 300′ to 600′ wide. At high tide, during storms, the breakers pass over the dune into the lagoon. Generally in winter an outlet near the south end is open, and the tide passes in and out, but in the summer this closes. The low hills near the ocean, north and south of the lagoon, consist of gravel and coarse sand, with oyster shells; evidently a recent marine deposit. Back, or east, of the lagoon the hills are 1,000′ to 1,200′ high, and here a bed of hard greenish conglomerate crops out. Farther south metamorphic black slates and gray sandstones were noticed, but their relative position could not be determined. Gold is found in the bottom of the lagoon and in the sand dune, and many ingenious contrivances have been constructed to save it, but it seems so far without success: the gold is too fine. Near the south end an ordinary "tom," with plates, is in position. Water is obtained from a small gulch ½ mile away. The sand is scraped into the sluice with little labor. Idle. Chas. F. Bradford, of Trinidad, owner.

China Flat Mine (Hydraulic).—It lies on Trinity River, 2½ miles above China Flat, and embraces 80 acres, at 560′ altitude. Water is taken from China Creek through a 3′x 2′ ditch, 2 miles long, and delivered through 200′ of 6″ pipe to a No. 1 giant, under 80′ pressure. A small reservoir is used when water becomes scarce. Alfred Foote, of China Flat, owner.

Clover Gulch (*Bistel*) *Mine* (Hydraulic).—See our XIIth Report, p. 132. It consists of 160 acres on Trinity River, 1 mile below China Flat, at 370′ altitude. Idle. Frank Bussel, of China Flat, owner.

Crooks Crest Mine (Hydraulic).—It lies on Klamath River, at mouth of Red Cap Creek, and contains 60 acres, at 520′ altitude. The bank is 30′ high, and all gravel. The construction of a ditch, 6′x 2′ and 3½ miles long, from Red Cap Creek has been commenced. Thos. T. Tighe, of Trinidad, owner.

Croton Bar Mine (Hydraulic).—Fully described in our XIIth Report, p. 132. It embraces 20 acres and lies on Klamath River, 1½ miles above Orleans Bar, at 770′ altitude. About 1 acre was washed in season of 1895. E. Markerson, of Orleans, owner.

Dungan Mine (Hydraulic).—It lies on Trinity River, 6 miles above China Flat, and contains 160 acres, at 540′ altitude. Water is derived from Campbell Creek by a 3′x 4′ ditch, 2 miles long, and delivered through 300′ of 10″ pipe to a No. 2 giant. The sluices are 24″ wide. The bank is 35′ high, and all gravel. Thos. Dungan, of China Flat, owner.

Ferris Mine (Hydraulic).—See our XIIth Report, p. 132. It lies on Klamath River, 1 mile below Orleans, and contains 30 acres, at 700′ altitude. A. Ferris, of Orleans Bar, owner.

Johnston's Mine (Beach).—See our XIth Report, p. 232. It extends for half a mile along the coast, 7 miles S. of the Klamath River, and contains 60 acres. Idle. A. D. Johnston, of Orick, owner.

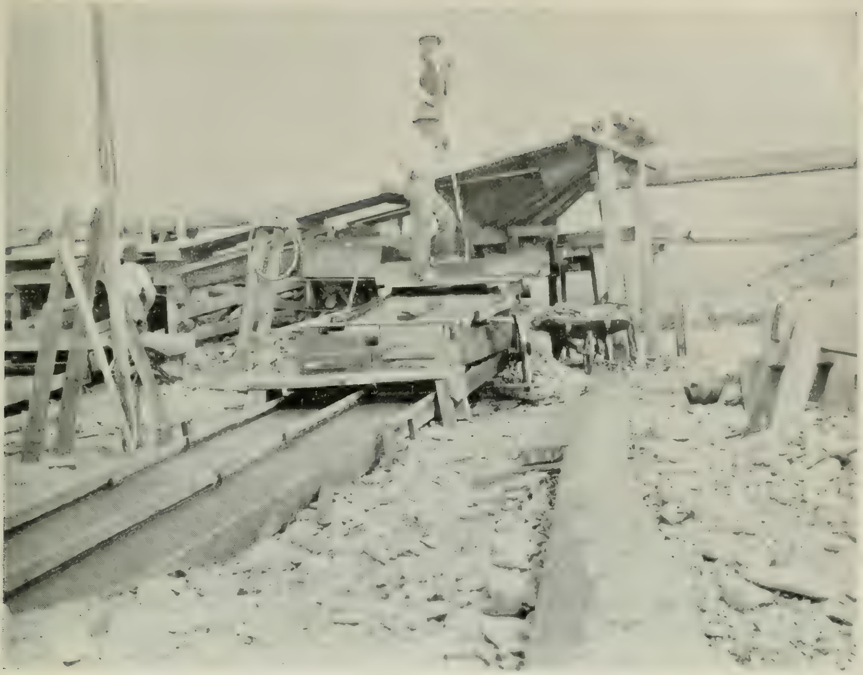
Little River Mine (Beach).—It lies at the mouth of Little River, 10 miles N. of Arcata, and contains 111 acres. South of the river, for 2½ miles, the ocean has thrown up a vast amount of fine white sand, which forms a high dune along the coast. Inside of the dune is a narrow strip of low land, and here the black sand is found in a solid stratum, 8′ thick, lying on the bedrock, and covered by 12′ of gray sand. Back of the mine are high bluffs of gravel—recent marine deposits. The black sand, mixed with water, is hoisted by an 8′x 2″ Chinese pump to the top of a frame, whence it drops on the tom. Several machines for saving the gold have been tried and abandoned. The company is now building an "Oregon machine"—see Union Mine. The sluice-boards are 36′ long, and set on a grade of 1¼″ to 1½″ per foot. The sand is rich in gold, and more so in platinum. The gold is fine, and hard to save. The platinum is coarser, and can be seen with the naked eye. A 16 H.P. engine furnishes the power for the pump and sand-pump. H. Close et al., of Eureka, owners.

Lupton Mine (Placer).—It lies on Willow Creek, a tributary of the Trinity, 5 miles W. of China Flat, and contains 20 acres, at 960′ altitude. Worked by ground-sluicing. Platte Lupton, of China Flat, owner.

Mettah Mine (Placer).—See our XIIth Report, p. 133. It lies on the Klamath bluff, and contains 20 acres. Altitude, 160′. It is worked by individual Chinamen, with rockers.

Moore Mine (Placer).—It is on Willow Creek, 4 miles W. of China Flat, and contains 20 acres, at 710′ altitude. Worked by wingdam and ground-sluicing in the creek bed. William Moore, of China Flat, owner.

Mowrick Mine (Hydraulic).—See our XIth Report, p. 230. This lies on the Klamath, 9 miles above Klamath, and contains 450 acres. Altitude, 2,000′. Water is taken from Capell Creek, through a ditch 4½



Oregon Tom, Union Mine.

Ordinary Toms, with Plates, Union Mine.

miles long, and passed through 600′ of 11″ pipe. Two benches have been explored, 1,500′ and 2,300′ above the river. Idle. Mowrick Hill Mining Co., owner; A. B. Campbell, of San José, Santa Clara County, superintendent.

Nanapier Mine (Placer).—See our XIIth Report, p. 133. It lies on the Klamath, half a mile below Klamath, and contains 20 acres, at 180′ altitude. Worked by ground-sluicing. F. Sebastion, of Klamath, owner.

Orleans Bar Mine (Hydraulic).—Fully described in our XIIth Report, p. 133. It lies at Orleans, on the Klamath River, and contains 2,500 acres, at 675′ altitude. About half an acre was worked in season of 1895. Orleans Bar Placer Mining Co., owner; P. L. Young, of Orleans Bar, superintendent.

Ossagan Mine (Hydraulic).—It lies on Ossagan Creek, 9 miles S. of the mouth of the Klamath River. Water is obtained from Prairie Creek, through a tunnel 1,000′ long. Idle for years. F. Adams, of Oakland, owner.

Pearch Mine (Hydraulic).—Fully described in our XIIth Report, p. 134. It lies 1 mile above Orleans, on the Klamath River, and contains 80 acres, at 690′ altitude. About half an acre was cleaned up during season of 1895. J. A. Pearch, of Orleans Bar, owner.

Pioneer (*Upper Gold Bluff*) *Mine* (Beach).—See our XIIth Report, p. 134. It is 12 miles from Klamath River, and contains 1,500 acres. It extends along the ocean 4 miles. It was worked by collecting sand on the beach and washing it in "toms," but has been idle since 1889. Edson T. Adams, of Oakland, owner; Chas. Savage, of Orick, manager.

Ramona Mine (Beach).—It lies 6 miles S. of the Klamath River, and contains 20 acres. The auriferous sands are collected, and washed in toms. Idle since 1894. Thos. Tighe, of Trinidad, owner.

Red Cap Mine (Hydraulic).—Described in our XIIth Report, p. 134. It lies on the Klamath River, 10 miles below Orleans Bar, and contains 10 acres, at 520′ altitude. About half an acre has been washed—cleaned up during the season of 1895. William Lord, of Orleans Bar, owner.

Salstrom's Mine (Hydraulic).—Described in our XIIth Report, p. 134. It contains 80 acres, at 670′ altitude, and lies 1½ miles below Orleans Bar, on the Klamath River. A rich pocket was found in this claim in 1895. Jonas Salstrom, of Orleans Bar, owner.

Stone Lagoon Mine (Beach).—It is at Stone Lagoon, 16 miles N. of Trinidad. Nearly every spring attempts are made to extract the gold from the beach sands at this place, but all of them have proven failures, on account of the fineness of the gold. At present the property is deserted.

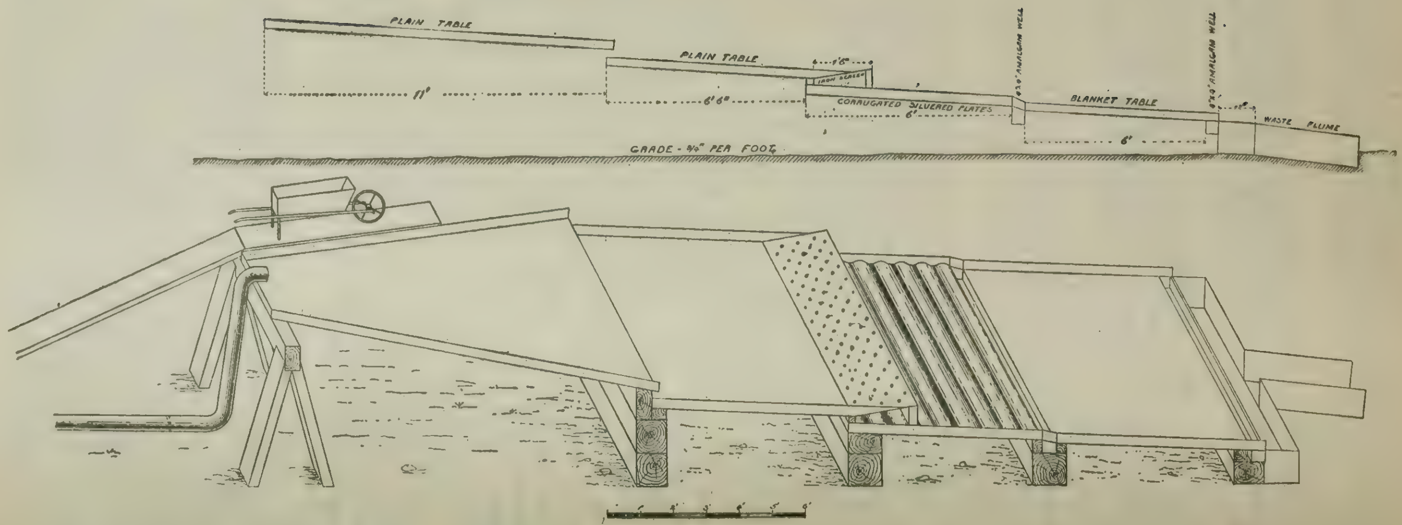
Swan's Mine (Beach).—See our XIth Report, p. 232. It lies N. of Redwood Creek, and contains 160 acres, having a frontage of 2 miles on the coast. It is worked by packing the sand from the beach on mules and washing in an ordinary "tom," with plates. One hundred and fifty tons were treated in 1895. R. Swan, of Orick, owner.

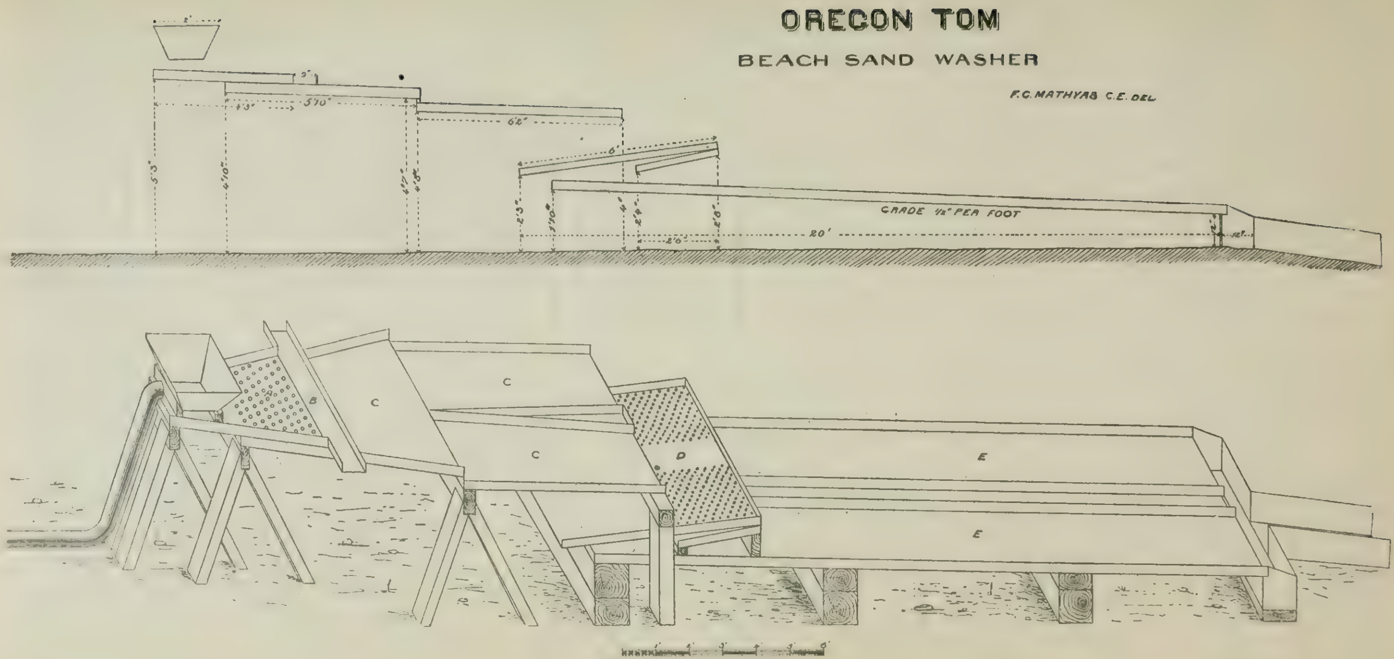
Union (*Lower Gold Bluff*) *Mine* (Beach).—It lies 16 miles S. of the Klamath River, and contains 1,900 acres, extending 4 miles along the ocean. The black sand is collected on the beach, and washed in "toms." If, after the tide has started to go down, black sand is noticed on the beach, men are at once set to work with square-toed shovels, sacking it. It is then packed on mules to the washing-machine, or temporarily

ORDINARY TOM

USED FOR WASHING BEACH SANDS

F.C. MATHYAS C.E. DEL.





OREGON TOM

BEACH SAND WASHER

F.C. MATHYAS C.E. DEL

stacked above the reach of high-water surf. A small lagoon on this claim is separated from the ocean by a sand dune, 500′ to 800′ wide and 15′ high. This dune contains gold in paying quantities, and quite a plant is established to extract it. A 16 H.P. engine is used to pump water for the toms and to hoist the sand to the hoppers. Two kinds of machines are used. There are three of the ordinary "tom" pattern, with amalgamated plates. The sand is dumped from a barrow on the "spreader," which is 11′ long, 2′ wide at the upper and 6′ wide at the lower end. It then drops 3″ to the "plane" table, 6′ wide and 6′ 6″ long, terminating with a sheet-iron screen with $\frac{1}{4}$″ perforations, and set on the reversed grade, where the gravel, drift wood, etc., are retained and removed frequently by an attendant. The clean sand then passes over a table, 6′ wide, 6′ long, and covered with corrugated silvered plates; thence to the "blanket" table, 6′ wide, 6′ long, and covered with a coarse blanket. These tables terminate with a mercury "trap," or well, 4″ wide, 4″ deep, and 6′ long, where fine gold, amalgam, and quicksilver are caught. The sands then pass to the waste flume. About 50 inches of water and three men are required to operate this machine, which loses some fine gold, but which might be remedied to a great extent by substituting tapestry or Brussels carpet for the blanket, as its use in the quartz mills of the central gold belt has given unqualified satisfaction in saving *very fine* gold. The other pattern is a recent invention, called the "Oregon machine," and also requires no power. It handles about 200 tons of sand in twenty-four hours, and is considered a success by the operators. It saves more of the fine gold than any machine yet tried. The sand is shoveled into cars, holding nearly a ton, and hoisted from the pit up an incline to the platform, and dumped from the car into a hopper; thence it falls on a grizzly, or screen *A*, where water causes the sand to separate from the larger gravel, which is removed by a square shovel into a waste chute, *B*. The sifted sand falls on table *C C C*, which gradually widens to 5′, where there is a drop of 4″, and the lower part of the table is divided in two parts, each 2′ wide, by a central rib. At lower end of table *C C*, the material drops 8″ on an iron plate, *D*, set on a reversed grade, and perforated with $\frac{1}{4}$″ holes. The fine sand passes through the perforations to two "gold-savers," *E E*, while the coarse sand is raked to one side. These gold-savers are each 25′ long, 2′ wide, and with 4″ sides. The bottom is made of a single 2″ plank, roughened with scratches like those made by a badly set circular saw, and dressed every few days with a *fluid which is said to attract the gold;* its composition is kept secret. It is said that a trial without the dressing resulted in some of the finer gold being lost. A "Gold King amalgamator" was tried here, but discarded because it required power, and also that the plates "scoured." The gold saved is mixed with about 5% coarse platinum. Twenty men are employed and twenty mules are used to pack black sand whenever there is any. Union Gold Bluff Mining Co., owner; Chas. F. Kapp, of San Francisco, superintendent.

Uscellina Mine (Hydraulic).—Described in our XIIth Report, p. 135. Altitude, 850′. L. Nelson, of Orleans Bar, owner.

Walther's Mine (Beach).—It is at Trinidad, and contains 20 acres. All of the auriferous sand (black and gray) is run through the "tom," which consists of a sluice-box, 14″ wide, with a screen, perforated with

¼″ holes, at the lower end to separate the material. The plates are arranged in a series of 12 steps, 14″x 8″, covered by a silvered plate.

White's Mine (Placer).—It lies on Willow Creek, 7 miles W. of China Flat, and contains 20 acres, at 1,150′ altitude. Dincen White, of China Flat, owner.

Weitchpec Mine (Hydraulic).—Described in our XIIth Report, p. 135. It lies at Weitchpec, on the Klamath River, at an altitude of 550′, and contains 25 acres. About ¼ acre was cleaned up in season of 1895. William Lord, of Orleans Bar, owner.

Inyo County.

Abe Lincoln Mine (Quartz).—See Luella.

Alvord Mine (Quartz).—It is on the western slope of the White Mountains, 6 miles E. of Big Pine, at 4,700′ elevation. The vein is 6″ to 3′ wide, courses N. and S., and dips 80° E., between slate and granite. It is prospected by a 75′ cross-cut tunnel, which taps the vein at 50′, where a 10′ winze has been sunk. The ore is free-milling, and is reduced in an arrastra on Burch Creek. M. A. Bush, of Alvord, owner.

American Flag Mine (Quartz).—See our XIIth Report, p. 135. Estate of Victor Trapier, of Lone Pine, owner.

Argus Gold Mining Co.'s Mines (Quartz).—See our XIIth Report, pp.. 136 and 140. They lie in Snow's Cañon, 4 miles S. of Modoc, at 5,000′ altitude, and embrace nine claims. The *Last Chance* and *St. Paul* are the principal ones. There are four long tunnels, besides many shorter ones on different veins. The main vein is 2′ to 4′ wide, and dips vertically between granite walls. A new shaft is being sunk to furnish air for the lowest long tunnel. A 5-stamp steam-power mill, using 750-lb. stamps, has been built, and is about ready to start. Argus Gold Mining Co., owner; E. C. Garlick, of Darwin, superintendent.

Baldy Mine (Quartz).—It is in Snow's Cañon, 3 miles S. of Modoc, at 4,460′ altitude, and embraces three claims, developed by four shafts, 10′ to 30′ deep. The vein occurs in granite, dips 85° S., and is 24″ to 30′ wide. Louis de Tournel, of Darwin, owner.

Barranca Mine (Quartz).—See our XIIth Report, p. 136. It lies in Hunter's Cañon, 16 miles E. of Lone Pine, at 7,000′ elevation, and embraces, among others, the *Briton & Porter* and *Barranca* mines, all being on the same vein. In the Barranca ground there is a 325′ tunnel along the vein; in the Briton & Porter ground an incline, 218′ deep, has been sunk, with a 110′ drift on the 100′ level, and one 60′ long on the 200′ level. The country rock is granite. The vein averages 6′ wide, and consists of a crushed mass of granite and quartz dipping 20° N. Five tons of ore is ground daily in three arrastras driven by a 12 H.P. engine. Hunter & Spears, of Lone Pine, owners.

Benicia Mine (Quartz).—It is in Robles Cañon, 16 miles E. of Lone Pine. A 3½′ vertical vein is developed by a tunnel 350′ long and a shaft 80′ deep. John Black et al., of Bishop, owners.

Black Warrior Mine (Quartz).—See Red Chief.

Blue Bell Mine (Quartz).—It is in Snow's Cañon, 14 miles S.E. of Darwin, at 5,000′ elevation. There is a 212′ tunnel on the vein, and a 30′ upraise with some stopes. The vein is 2″ to 6″ thick, dipping 45° S.W., and runs from the granite into limestone; in the former the quartz is rich, while in the latter it is almost barren. J. J. Morton, of Keeler, owner.

Bonanza Mine (Quartz).—See our XIIth Report, p. 136. It is in Mountain Spring Cañon, 25 miles S. of Darwin. The shaft has been deepened to 250′, and another drift started. The horse-power arrastra crushes 1 ton per day. John Andrada, of Freeman, owner.

Brown Monster (*Eclipse*) *Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 263 and 136. It is on the western base of the Inyo range, 10 miles S.E. of Independence. Idle. A. W. Eibeschutz, of Independence, owner.

Carrie Crouse Mine (Quartz).—It is on Jackknife Hill, 12 miles S.W. of Big Pine, at 5,500′ elevation. The vein, 2″ to 12″ wide, courses N. and S., and dips nearly vertically. A 150′ tunnel on the vein gives 75′ of backs. A 45′ shaft has been sunk on the vein in the south end. The ore is reduced in an arrastra, 2 miles distant. S. W. Jones, of Big Pine, owner.

Casey Mine (Quartz).—It is 5 miles N. of Laws. The vein is 8″ to 3′ wide, and dips 30° N.E. between slate walls. There is a tunnel 300′ long, with a 400′ winze at its end. Hoisting is done by a horse-whim outside of the tunnel, the rope running between the car tracks. A 5-stamp mill, using 1,000-lb. stamps, belongs to the property. It is driven by a 3′ Pelton wheel under 185′ pressure. About 14 tons are crushed per day. Inyo Gold Mining Co., owner; O. E. Duenwig, of Laws, superintendent.

Chilulu, Gavilan, Montano, and San Antonio Mines (Quartz).—See our XIIth Report, p. 137. This group lies near the head of Robles Cañon, on the eastern slope of the Inyo range, 16 miles E. of Lone Pine. Idle. Charles Green et al., of Lone Pine, owners.

Copper King and Copper Queen Mines (Quartz).—They lie on Little Pine Creek, 8 miles S.W. of Big Pine, at 6,200′ altitude, and are located on an 8″ to 12″ vein of auriferous quartz carrying a large percentage of chalcopyrite. Developed by a 40′ shaft. F. D. Pratt, of Big Pine, owner.

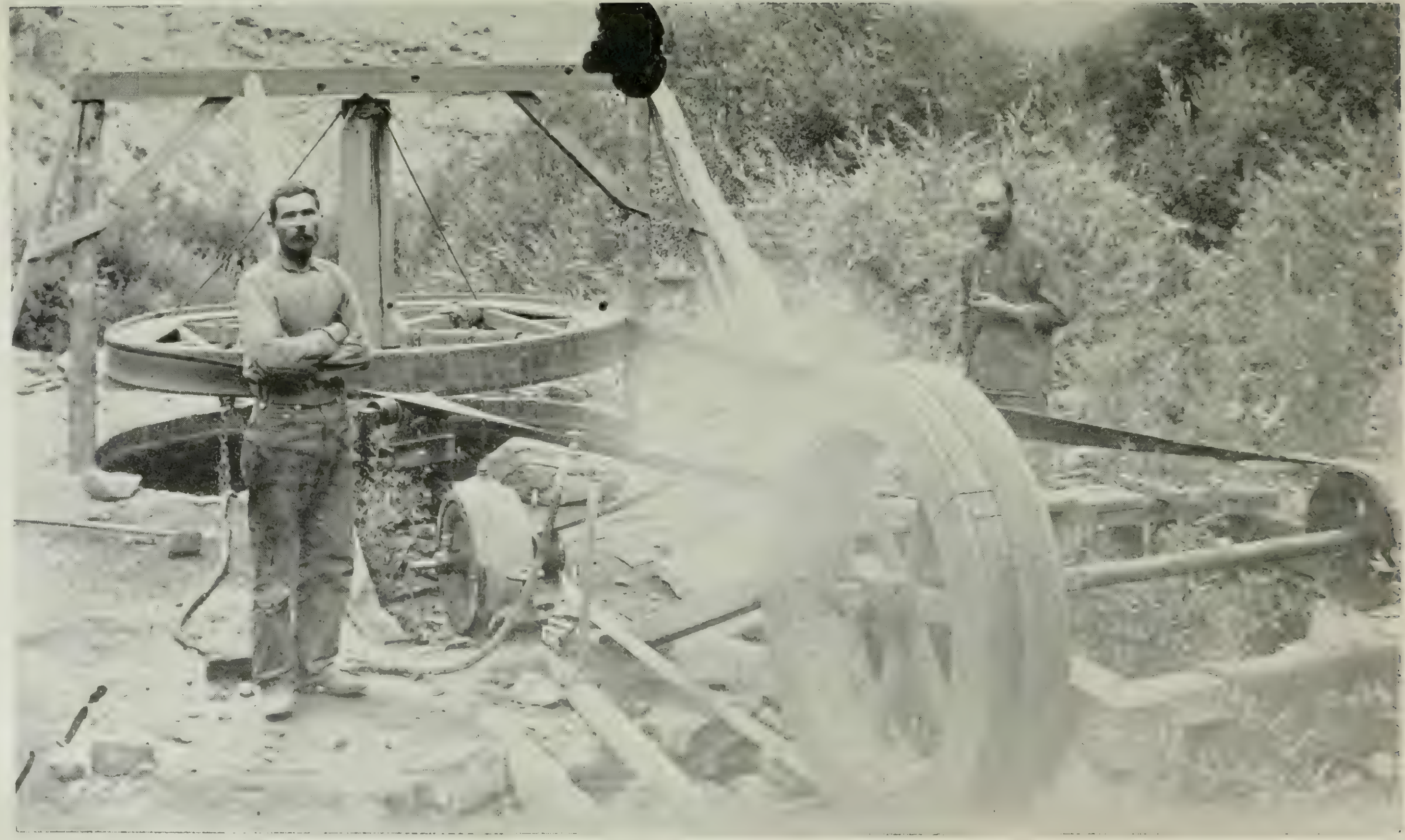
December Mine (Quartz).—It is in the foothills, 2 miles N.W. of Lone Pine, at 4,060′ altitude. It embraces three claims along a vein 6″ to 2′ wide. The immediate walls are porphyry; the country rock syenite. The quartz contains iron and copper pyrite, and occasionally a cluster of galena. It is treated in a water-power arrastra ½ mile distant. There is a 100′ tunnel and 135′ of drifts. Ore is being extracted at present from the surface only, where the vein, which below dips 40° S.W., lies quite flat, and is covered merely by a few feet of stratified tufa. R. C. Spear, of Lone Pine, owner.

Dido Mine (Quartz).—See Georgia.

Dodd Mine (Quartz).—It is in Lee District, 20 miles N. of Darwin. David Pabst, of Lone Pine, owner.

Free Coinage Mine (Quartz).—It is in Snow's Cañon, 5 miles S. of Modoc, at 5,000′ altitude. An 8″ vein is being mined in two tunnels, 20′ and 80′ long, and it dips vertically between granite walls. Paul Pfefferle, of Modoc, owner.

Garfield Mine (Quartz).—See our XIIth Report, p. 137. It is in Fish Springs District. No new developments. Jerry Moier, of Independence, owner.



Arrastra of the Georgia Mine.

Georgia Mine (Quartz).—See our XIIth Report, p. 137. It is in Redding Cañon, 9 miles E. of Bishop, at about 7,000′ elevation, and includes the *Dido* and *Twilight* claims. The vein is bunchy in character, running from 1″ to 2′ in width and dipping 50° N. between walls of granite. Developments consist of a tunnel 345′ long, having an inclined winze 170′ deep, at a point 150′ from its mouth. The rich quartz is treated in a 10′ arrastra, driven by 12 miner's inches of water on an 18″ Dodd wheel, under 90′ pressure, received through 450′ of 4″ pipe. The drags (mullers) weigh from 300 to 800 lbs. and make about eight revolutions per minute. George F. Willis, of Independence, owner.

Gold Bug Mine (Quartz).—See our XIIth Report, p. 137. It is on Fish Springs Hill, 20 miles N. of Independence.

Gold Dollar Mine (Placer).—It is 7 miles N.E. of Independence, and comprises 20 acres of gravel from 4″ to 1′ deep. Worked with a dry-washer. George Thorpe, of Independence, owner.

Golden Reef (*Hardscrabble*) *Mine* (Quartz).—See our XIIth Report, p. 137. It is in Fish Springs District. Idle. James McCarty, of Tinemaha, owner.

Gold Gulch Mine (Quartz).—See our XIIth Report, p. 137. It lies in Gold Gulch, on the western slope of the Panamint range. Idle. R. W. McIntyre et al., of Redlands, San Bernardino County, owners.

Good Luck Mine (Quartz).—It is on Little Pine Creek, 8 miles S.W. of Big Pine, at 6,300′ elevation. A tunnel 106′ long develops a 3′ vein of quartz dipping 65° N.W. The ore shows some sulphurets. F. D. Pratt, of Big Pine, owner.

Goodwin Mine (Quartz).—It is in Snow's Cañon, 3 miles S. of Modoc, at 4,750′ altitude. A 6″ vein of rich quartz is exposed in a partly stoped 50′ tunnel, and dips 85° S. between granite walls. Louis de Tournel, of Darwin, owner.

Hardscrabble Mine (Quartz).—See Golden Reef.

Hirsch Mine (Quartz).—See our XIIth Report, p. 138. It is on the western slope of the Inyo Mountains, 10 miles S.E. of Independence, at 4,500′ elevation. The vein dips 35° N.E. in limestone, and varies from 3′ to 8′ in width. The quartz ore contains galena, in sometimes large bunches, besides iron and copper pyrites. The mine is developed by a tunnel 300′ long, at the end of which underhand stoping is carried on to a depth of about 50′. A tramway ½ mile long conveys the ore to a 10-stamp mill, which is driven by a 22″ Leffel turbine wheel under a 28′ head. The stamps weigh 1,000 lbs., and the sulphurets are saved by two Frue vanners. Reward Mining Co., owner; George T. Reeves, of Frances P. O., superintendent.

Hope and Arrastra Mines (Quartz).—See our XIIth Report, p. 138. They lie in the Inyo range, 15 miles N. of Independence. Nathan Rhine, of Independence, owner.

Josephine Mine (Quartz).—See our XIIth Report, p. 138. It is 8 miles S.W. of Darwin. Idle. J. Wilson, of Lone Pine, owner.

Keynote Mines (Quartz).—See our XIIth Report, p. 138. They comprise the *Beauty*, *El Paso*, *King*, *Lone Pine*, *Mexican*, and *Queen*, and lie on the eastern slope of the Inyo range, at 8,000′ elevation. Some stoping is being done in the lowest tunnel. A 5-stamp steam-power mill, with 750-lb. stamps, belongs to the property. J. Laskey, of San Francisco, owner.

Keys' Mine (Quartz).—See our XIIth Report, p. 138. It is in Beveridge District, 20 miles E. of Independence, at 8,000′ altitude. Quartz is being stoped from the drifts as fast as they can be extended, and is milled in a steam-power arrastra, 8 miles S. of the mine. The vein is in granite, and averages 14″ in width. Pat Keys, of Independence, owner.

Lakeview Mine (Placer).—It is 7 miles N. of Independence, and comprises 20 acres. The gravel, 4″ to 1′ deep, is worked in a dry-washer. J. W. Wright, of Independence, owner.

Last Chance Mine (Quartz).—See Argus Gold Mining Co.

Laura and McAvoy Mines (Quartz).—See our XIIth Report, p. 138. Idle, as also is the 5-stamp mill. A. F. Mairs, of Independence, owner.

Luella (*Abe Lincoln*) *Mine* (Quartz).—See our XIIth Report, p. 139. It is in Alabama District, 6 miles N.W. of Lone Pine, at 4,450′ altitude, and is located on a vertical vein, 3″ to 6″ thick, occurring in granite. The rich, free-milling quartz is treated in a water-power arrastra. John Basto, of Independence, owner.

McAvery Mine (Quartz).—It is in Snow's Cañon, 4 miles S. of Modoc, at 5,050′ elevation. The vein consists of 4′ of talcose matter carrying gold, and dips 85° N. between granite walls. It is developed by a 150′ tunnel on the vein. George McAvery, of Modoc, owner.

Magnet Mine (Quartz).—See Tombstone.

Mariposa Mine (Quartz).—See our XIIth Report, p. 139. It is a patented claim a little N. of Coso. Idle. J. B. Haggin, of New York, owner.

May Mine (Quartz).—It is in Fish Springs District, 3 miles S. of Tinemaha. An 8″ vein is developed by a 70′ shaft and 50′ of drifts. The quartz contains about 8% of rich sulphurets, and is crushed in a water-power arrastra. C. F. Fuller, of Tinemaha, owner.

Mazourka Cañon Placer Mines.—See our XIIth Report, p. 139. They are on the western slope of the Inyo Mountains, 7 miles E. of Independence. The gold is found in from 6″ to 4′ of drift, lying in the small tributaries of Mazourka Cañon. It is all coarse; nuggets weighing from $1 to $10 are frequently picked up, some being still attached to quartz. The pay-dirt is run through dry-washers, yielding, it is said, $4 per man per day. The following parties own claims in the cañon:

	Machines.	Men at Work.
Race Carasco	3	7
Cerro Gordo	1	2
Elario Arambula	1	2
A. McMullin	1	2
J. Ramsey	1	2
McCormick Bros.	1	2
Jos. Glass	3	6

Several small quartz veins were noticed in the cliffs above the gold find, but proved to be barren.

Mountain Chief Mine (Quartz).—It is on Cottonwood Creek, 25 miles E. of Bishop. A 60′ shaft with a 70′ drift has been made on a 2′ free-milling quartz vein. J. D. Jones, of Bishop, owner.

North Star Mine (Quartz).—It is in Alabama District, 6 miles N.W. of Lone Pine, at 4,450′ elevation. The vein is 3″ to 12″ thick, and dips 85° W. in granite. The ore is a mass of auriferous sulphurets. Developed by an 80′ shaft. Julius Schroeder, of Independence, owner.

North Star Mines (Quartz).—This group lies in Snow's Cañon, 2½ miles S. of Modoc, at 5,100′ elevation, and embraces four claims recently located. So far four veins, from 12″ to 36″ wide, have been found in the property. Only surface work is done. Paul Pfefferle, of Modoc, owner.

Polita Mine (Quartz).—See our XIIth Report, p. 139. It is in Redding Cañon, 9 miles E. of Bishop, at 5,500′ altitude. The winze has been extended to a depth of 175′, and drifts run 50′ E. and 60′ W. The vein averages 24″, and dips 40° N. The arrastra is driven by an 18″ Dodd wheel under 165′ pressure. George Storey, of Bishop, owner.

Post Office Springs Mine (Quartz).—See our XIIth Report, p. 139. It is on the Panamint range, 2 miles E. of Post Office Springs, at 5,000′ elevation. A 5-stamp mill, using 750-lb. stamps, and a concentrator, have been erected. Very little development work is done. The ore in sight was taken out and milled. Charles Anthony, of Darwin, owner.

Queen Mine (Quartz).—See our XIIth Report, p. 140. It is 20 miles N. of Independence. Thomas Hill, of Big Pine, owner.

Red Chief (Black Warrior) Mine (Quartz).—It is on Big Pine Creek, 7 miles W. of Big Pine, at 6,477′ elevation. A 40′ cross-cut tunnel cuts the 2′ vein, and gives 60′ of backs. A winze sunk on the vein at this place is 100′ deep, and a 225′ tunnel, running west on the vein, exposes a fine body of ore, which is treated in a water-power arrastra close by. Daniel M. Trestle, of Bakersfield, Kern County, owner.

Rio Vista Mine (Quartz).—See our XIIth Report, p. 140. It is in Fish Springs District. Idle. J. McCarthy, of Big Pine, owner.

Rose Mine (Quartz).—It is in Fish Springs District, 2 miles W. of Tinemaha, and is developed by a 200′ tunnel, partly stoped. The vein lies in granite on a dip of 80° W., and shows from 6″ to 18″ quartz with few sulphurets. Ed. Rose, of Tinemaha, owner.

Sanger Co.'s Mines (Quartz).—See our XIIth Report, p. 140. The twenty-three claims lie 20 miles S. of Darwin, in the Argus range. No recent developments. A 5-stamp mill is to be erected. Mills & Stiles, of Freeman, owners.

Santa Cruz Mine (Quartz).—It is in Robles Cañon, 16 miles E. of Lone Pine. The vein is bunchy, varying from a mere seam to 5′ in width. It is developed by two tunnels, 60′ and 300′ long, which are connected by a 100′ winze. John Black, of Bishop, owner.

Sharp Mine (Quartz).—It is in Alabama District, 6 miles N.W. of Lone Pine. The vein occurs in granite, is 6″ wide, and dips 30° E. A 150′ tunnel on the vein is being stoped. James Sharp, of Independence, owner.

Slate Range is the most southerly spur of the Argus Mountains, and lies from 40 to 60 miles S. of Darwin. Considerable prospecting for gold is going on, and some 30 men are said to be at work. The country seems to be promising, but so far no great strikes have been made.

St. Elmo Mine (Quartz).—It is in Robles Cañon, 16 miles E. of Lone Pine. There are two inclines, 150′ apart, 35′ and 50′ deep, respectively, and connected by a drift. The vein is 4′ wide, and dips 40° N. John Black et al., of Bishop, owners.

St. Paul Mine (Quartz).—See Argus Gold Mining Co.

Stone Cabin Mine (Quartz).—It is in Snow's Cañon, 2½ miles S. of Modoc, at 5,150′ elevation. A 6″ vein of free-milling quartz, dipping vertically between granite walls, is exposed in three shafts, 10′ deep. Paul Pfefferle, of Modoc, owner.

Tip Top Mine (Quartz).—See our XIIth Report, p. 140. It is 8 miles S. of Big Pine, in Fish Springs District, at about 5,000′ elevation. The

6″ to 15′ vein courses E. and W., and dips slightly to the north. Developed by two tunnels, 250′ and 400′ long, giving 300′ of backs. The rock is worked in a 12′ arrastra in Burch Creek, 1 mile S. of the claim. It is run by a 12′ overshot waterwheel. N. Tracy, of Big Pine, owner.

Tombstone (*Magnet*) *Mine* (Quartz).—See our XIIth Report, p. 139. It is in Fish Spring District, 12 miles S. of Big Pine, at 5,400′ elevation. The 2′ to 5′ vein courses E. and W., dipping nearly vertically between a granite foot-wall and diorite hanging-wall. The quartz contains about 6% of rich sulphurets. Developed by two tunnels and several winzes. The main tunnel is 700′ long, and has passed through three shoots of ore, each about 60′ long. Two winzes from this tunnel are 50′ deep, and show a 3′ vein in the bottom. The ore is worked in an arrastra on Burch Creek, 1 mile distant. G. B. Cometti, of Big Pine, owner.

Waterman's Mill.—It is at Coso, 8 miles S.W. of Darwin, and has 5 stamps of 850 lbs. each. Power is furnished by a 12 H.P. engine. Wood costs $10 per cord. Mills custom ores exclusively. W. M. Waterman, of Darwin, owner.

Yellow Jacket Mining Co's. Mines (Quartz).—See our XIIth Report, p. 141. Its four claims lie in the White Mountains, 12 miles E. of Bishop Creek. Idle.

MILLS IN INYO COUNTY.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of Each, in Lbs.	Capacity, per 24 Hrs., in Tons.
Argus	Gas	5	750	5
Casey	Water	5	1,000	14
Golden West	Steam	5	700	10
Hirsch †	Water	10	1,000	----------
Ibex	Steam	5	600	5
Kearsarge	Water	10	650	15
Keynote	Steam	5	750	10
Laura	Steam	5	600	5
Los Angeles	Steam	10	850	20
Maxim	Steam	5	950	8
McEvoy*	Steam	5	900	10
Old Coso	Steam	5	700	10
Owens Lake	Steam	10	850	15
Post Office Spring	Steam	5	750	----------
Redlands	Steam	5	800	8
Reward	Water	10	900	20
Rex Mortis	Water	5	750	10
Sanger	----------	5	----------	----------
Surprise	Steam	10	950	20
Waterman	Steam	5	850	----------
Wilson and Wibbelt	Steam	2	800	5

† Has 2 Frue concentrators.

In addition to stamps, the mills marked with a * have additional crushing capacity as noted in the following list:

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN INYO COUNTY.

Name of Mill or Mine.	Power.	Number	Character.	Diameter	Capacity per 24 Hrs., in Tons
Alvord	Water	1	Arrastra		
Barranca	Steam	3	Arrastra		
Bonanza	Horse	1	Arrastra		1
Carrie Crouse		1	Arrastra		
Confidence	Gas		Roller		25
December	Water	1	Arrastra		
Garfield	Water	1	Arrastra		1
Georgia	Water	1	Arrastra		2½
Gold Dollar		1	Dry-Washer		
Keys	Steam	1	Arrastra		
Lakeview		1	Dry-Washer		
Luella	Water	1	Arrastra		1
Magnet	Water	1	Arrastra		1¼
May	Water	1	Arrastra		1
Mazourka Cañon		11	Dry-Washer		
McEvoy	Steam	1	Arrastra		1
Piute	Water	1	Arrastra		
Polita	Water	1	Arrastra		
Red Chief	Water	1	Arrastra		
Tip Top	Water	1	Arrastra		
Tombstone	Water	1	Arrastra		

CUSTOM WORKS IN INYO COUNTY.

Waterman's Mill. (No data.)

Kern County.

During the last two years the mining industry in Kern County has experienced a great revival. In the older camps, as White River, Kern River, Havilah, and Caliente, the old mines are being reopened and operated by men with capital, and many of them will, no doubt, make steady producers.

Although the discoveries of placer gold in Goler, Red Rock, and Summit, described in our XIIth Report, p. 456, have not been of much importance in themselves, they have attracted prospectors to that part of the county, and the discovery of the Randsburg district is the result. The Randsburg range is a long, low ridge of hills in the desert, running north and south, about 35 miles long and 3 to 6 miles wide. Its southern extremity reaches to a point about 20 miles N.E. of Mojave. The ridge is an uplift of diorite to a height of 1,000′ to 1,500′ above the level of the surrounding desert, and is flanked by heavy beds of metamorphic rocks (hornblende schists), dipping as much as 45° in places away from the center of eruption. The gold is found in quartz veins in the diorite, running, seemingly, at different courses. Not enough underground exploration has been done to form an idea of their relative position or connection. Just east of the town of Randsburg, a strong vein of white glassy quartz, running N.W. and S.E., and dipping nearly vertically, outcrops 10′ to 12′ above ground, and many others of similar nature and strike occur in the vicinity. None of them shows a trace of gold. The gold-bearing veins contain a dirty yellow or dead white quartz, and strike at different courses. Which of the two series is the older has not been determined.

Several of the discoveries are on large and rich veins, and will, no doubt, make good mines. New finds are reported frequently, and the future of Randsburg, as a large gold-producer, seems promising.

The valley lands are made productive by an extensive irrigation system. Agriculture, horticulture, and the following mineral industries are important sources of revenue: liquid and rock asphaltum, on the western side of the valley; limestone, near Tehachapi; antimony, in San Emidio Cañon; and undeveloped impure gypsum deposits in the foothills on the western side of the valley.

Alta Queen Mine (Quartz).—It is at the head of Grizzly Gulch, 5 miles S.E. of White River, at 3,600′ elevation. The vein is 6″ wide, and dips 40° S. in granite. The development consists of a 300′ tunnel and several small openings. D. Towsley, of White River, Tulare County, owner.

Ashford Mines (Quartz).—This group is 1½ miles E. of Randsburg, at 3,800′ elevation, and comprise the *Eagle's Nest*, *Fairy Prince*, *Fairy Queen*, *Hector*, *King Solomon*, *Magpie*, *Miranda*, *Pinmore*, *Rocket*, and *Wasp*. The veins are small, 6″ to 12″ wide, and have a general course of S.E. and N.W. Only surface work is done on any of them. Ashford Bros. Co., of Randsburg, owners.

Bald Eagle Mine (Dry Placer).—See Goler District.

Bald Eagle Mine (Quartz).—It is 3 miles N.E. of Havilah. Idle. Dan Doherty, of Havilah, owner.

Barton Mines (Quartz).—They lie on Piute Mountain, 9 miles N.E. of Piute. A 5-stamp steam-power mill belongs to the property. S. Barton, of Claraville, owner.

Bear Track Flat Mine (Hydraulic).—It is on Greenhorn Mountain, 7 miles N.W. of Havilah, at 5,150′ altitude, and contains 20 acres. Water is taken from Greenhorn Creek by ½ mile of 2′x 2′ ditch. The outfit consists of 200′ of 8″ pipe, 100′ of 7″ hose, and a 2″ nozzle. The pressure is 30′, and the bank of gravel averages 3′ in thickness. J. B. Calland, of Woody, owner.

Bella Rufin (*Berry*) *Mine* (Quartz).—See our XIIth Report, p. 142. It is 2 miles W. of Piute, at 3,000′ altitude. The vein occurs in granite, is 2′ wide, strikes N. 65° W., and dips 50° N.E. It is developed by a 75′ shaft with short drifts. Stuter & McKay, of Amalie, owners.

Bevel Mine (Quartz).—See Isabella Extension.

Big Blue (*Sumner*) *Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 315 and 142. It is 1 mile N. of Kernville, at 2,750′ elevation, and embraces eleven claims on the *Big Blue* vein and seven claims located on a series of smaller veins, from 4″ to 36″ thick, which run into the Big Blue vein from the north, at an angle of about 60°. The former are named the *Big Blue*, *Commonwealth*, *Content*, *Nelly Dent*, *Nelly Dent Extension*, *Sumner*, and *Sumner 5 Extensions*. The latter are the *Beauregard*, *Bull Run*, *Frank*, *Jeff Davis*, *Lady Bell*, and *Urbana*. The mine is practically idle, only tribute work being done. An 80-stamp water-power mill belongs to the property. Thomas Price & Co., of San Francisco, owners; Benjamin Price, of Kernville, superintendent.

Big Bonanza Mine (Quartz).—It is on Basin Creek, 5 miles N. of Caliente. Development consists of a tunnel 80′ long, and a shaft 40′

deep. The vein is 4′ wide, is filled with crushed talcose material carrying gold, and dips 65° N.W. in granite. J. B. Ferris, of Caliente, owner.

Big Horse Mine (Quartz).—See Olympus.

Blackfoot Mine (Quartz).—It is near the Long Tom, 23 miles N.E. of Bakersfield, at 1,500′ elevation. The vein lies in granite, dips 45° N., and averages about 12″ in width. The shaft is 80′ deep, with drifts both ways, about 60′ long. A. T. Tucker, of White River, Tulare County, owner.

Blackhawk Mine (Quartz).—It is 3 miles S.E. of Randsburg, at 3,000′ altitude. There are three parallel veins a short distance apart, each about 18″ wide, and dipping 50° E. The development consists of a 100′ shaft on the vein, and a 150′ drift on the 60′ level. D. C. Kuffel, of Randsburg, owner.

Black & Sullivan Mine (Placer).—See Red Rock District.

Blue Mountain Mine (Quartz).—See our XIIth Report, p. 296. It is 6 miles S.E. of White River, at 3,600′ elevation. The vein is 4″ to 16″ thick, dips 85° S., and lies in granite. It is developed by a 45′ shaft and a 25′ drift. J. C. McDonald, of White River, Tulare County, owner.

Bob Lee Mine (Quartz).—See our XIIth Report, p. 142. It is 2 miles W. of Kernville, at 2,660′ altitude. Idle. Robinson Bros., of Kernville, owners.

Bonanza Mines.—See Red Rock District.

Bright Star Mine (Quartz).—See our XIIth Report, p. 142. It is 13 miles N.E. of Piute. Idle. Parke & Lacy, of San Francisco, owners.

Brogan Mine (Quartz).—See our XIIth Report, p. 142. It is 2 miles S. of Piute, at 3,380′ altitude, and embraces three claims. The vein is 6′ wide, with 6″ to 12″ of quartz. The walls are porphyry, and the dip is 65° N.E. A new shaft has been sunk 80′, and a drift is being run from the bottom. Wm. Shipsey, of Piute, owner.

Bullion Mine (Quartz).—See our XIIth Report, p. 143. It is 1 mile W. of Claraville. Albert Bartholomy, of Onyx, owner.

Burcham Mine (Quartz).—See Olympus.

Burdette Mine (Quartz).—It is in Long Tom Gulch, 27 miles N.E. of Bakersfield, at 1,870′ elevation. The vein occurs in granite, and dips 45° N. A 70′ shaft and several surface cuts disclose 6″ to 12″ of quartz. Henry Burdette, of Bakersfield, owner.

Butte Mine (Quartz).—It is in Fiddler's Gulch, 1 mile N. of Randsburg, at 3,500′ elevation, and is a recent and promising location. The vein is 3′ wide and dips 80° N. in a dioritic rock. Near the hanging-wall is a 4″ to 6″ streak of white quartz, showing free gold throughout; the rest of the vein matter is a crushed quartz, mixed with talc, also rich in gold. There are two 50′ shafts on the claim and several open cuts. The surface debris below the cropping is being run through a dry-washer, and the coarse material is picked over by hand to save the rich quartz float. The gold is free, and no sulphurets are visible. There is no water in the vicinity, and the ore is hauled to a stamp mill at Cow Wells, 20 miles away. The milling charges are $15 per ton. Wages are $2 a day and board. Freight from Mojave is 75 cents per cental. Lumber costs $40 per M. Firewood is hauled from Tehachapi, 75 miles distant, and water costs 5 cents a gallon. H. C. Ramie et al., of Randsburg, owners.

Butte Wedge Mine (Quartz).—It is the west extension of and contains about 70′ of the Butte vein, and between it and the Kenyon Mine a tunnel is being run to find the vein. H. Kearns and J. Dillon, of Randsburg, owners.

California Mine (Quartz).—See Olympus.

Canfield Mines (Placer).—See our XIIth Report, p. 143. They comprise fifty-one claims in Bonanza Gulch, 2 miles E. of Red Rock. No water brought to them yet. Canfield Mining Co., of Los Angeles, owner.

Champion Mine (Dry Placer).—See Red Rock District.

Champion Mine (Quartz).—It is 7 miles S.E. of White River, at 1,420′ altitude. The vein, 4″ to 12″ wide, lies in granite and dips 80° S. It is developed by a 100′ tunnel, with drifts 60′ and 40′ long. Andrew Monroe, of White River, Tulare County, owner.

Chief Mine (Quartz).—It is ½ mile E. of the Long Tom, and 25 miles N.E. of Bakersfield, at 1,850′ altitude. The development consists of two tunnels, 250′ and 300′ long, with a 60′ winze at the end of the longer one. The vein is 8″ to 24″ wide, and dips 30° S.E. in granite. D. M. Tressel, of Bakersfield, owner.

Cincinnati Mine (Dry Placer).—See Goler District.

Clay Bank Mine (Quartz).—It is 1 mile W. of Havilah, at 4,170′ altitude. A cross-tunnel, 1,000′ long, and some 1,500′ of drifts, constitute the developments. Has been idle several years. Charles E. Sherman, of Havilah, owner.

Colorado (*Morning Star*) *Mine* (Quartz).—See our XIIth Report, p. 146. It is in Grizzly Gulch, 4 miles S.E. of White River, at 1,410′ elevation. There are two tunnels, 60′ and 75′ long, on the vein, which dips 45° S.E. in granite, and varies from 4″ to 36″ in width. E. A. Gates, of White River, Tulare County, owner.

Comet Mine (Quartz).—It is on Fremont Gulch, 8½ miles N.W. of Havilah, at 4,950′ altitude. The vein is 8″ wide, and dips 45° S.E. in granite. The development consists of a 50′ shaft and a 50′ tunnel on the vein. Andrew McNitt, of White River, Tulare County, owner.

Davis Mine (Quartz).—It is 25 miles N.E. of Bakersfield, at 1,850′ elevation. The vein is 2′ wide, and dips 45° N. between granite walls. A cross-cut tunnel is being driven to tap the vein. William Davis, of Bakersfield, owner.

Dead Tree Mine (Quartz).—It is on Cottonwood Mountain, 6 miles N.E. of Piute, at 6,000′ elevation. There are two shafts, 20′ and 30′ deep, and several open cuts on the claim. The vein is 3″ thick, dips 40° S. between granite walls. The ore is treated in a horse-power arrastra. John Hutchins, of Piute, owner.

Defender Mine (Quartz).—This is one of the new discoveries in the Mojave Desert, ¾ mile E. of Randsburg, at 4,550′ altitude. A strong vein of rich quartz is exposed in an open cut. E. B. Maginnis et al., of Randsburg, owners.

Dolly Mine (Quartz).—See our XIIth Report, p. 143. It lies 14 miles E. of Caliente, at 2,960′ elevation. Idle. A. Souser, of Caliente, owner.

Dos Picannini Mine (Quartz).—It is in Fiddler's Gulch, 1 mile E. of Randsburg, at 3,400′ elevation. The development consists of a shaft 40′ deep, following the vein on a slope of 40° S. It is an extension of the Maria and on the same vein. Benson Bros. et al., of Randsburg, owners.

Dreadnaught Mine (Quartz).—See Hardtack.

Eagle's Nest Mine (Quartz).—See Ashford.

Eclipse No. 1 Mine (Quartz).—It is 1½ miles N.W. of Woody, at 1,400′ altitude. The 12″ vein stands vertically in granite. The new development consists of a cross-cut tunnel 60′ long, and 50′ of drifts at the bottom of a 50′ winze. A. Weil, of Bakersfield, owner.

Elsy & Groves' Mine (Quartz).—It is near Kern River, 4 miles S. of Isabella, at 2,480′ altitude, and is on a vertical vein in granite, 4′ wide. It is worked through a tunnel 600′ long. Elsy & Groves, of Isabella, owners.

Emerald Mine (Quartz).—See our XIIth Report, p. 143. It is 4½ miles N.E. of Piute, at 4,700′ elevation. The older workings being flooded, a drain tunnel has been started. It will be 300′ long and tap the vein 100′ below the deepest stopes. The vein is 5′ to 7′ thick and dips 85° S. in granite. J. B. Ferris, of Caliente, owner.

Empire Mine (Quartz).—It is on Greenhorn Mountain, 8 miles N.W. of Havilah, at 5,500′ altitude. The development consists of three shafts, 75′, 65′, and 50′ deep, with a drift in the bottom of the latter, 90′ long. The vein is 8″ wide, dips 45° S.E. in granite. F. F. Boettler, of Woody, owner.

Exchange Mine (Dry Placer).—See Goler District.

Fairy King Mine (Quartz).—See Ashford.

Fairy Queen Mine (Quartz).—See Ashford.

Flying Dutchman Mine (Quartz).—It is 4 miles S. of Havilah, at 4,400′ elevation. The claim is located on a 12″ vein, in granite, dipping 80° E. A 150′ tunnel and an 80′ shaft constitute the development. John Hayes, of Havilah, owner.

Friday Mine (Quartz).—It is 2 miles N.W. of Havilah, at 4,400′ altitude, and is located on an 18″ vein, dipping 85° E. in granite. Developed by a 150′ shaft and several short tunnels. Jacob Estlebaum, of Havilah, owner.

Garlock's Custom Mill.—It is at Caldwell, 30 miles N. of Mojave, at 2,420′ altitude, and has 8 stamps of 750 lbs. weight, using No. 9 slot screens. Only 4 stamps are running about two hours per day, for want of water. Water is obtained from a bored well, 200′ deep. A shaft is being sunk to provide water enough to run the full mill night and day. Wood is hauled 60 miles, from Tehachapi. U. S. Garlock, of Mojave, owner.

G. B. Mine (Quartz).—It is a recent discovery in the desert, near the Blackhawk, 2½ miles S.E. of Randsburg, at 3,200′ elevation. A 30′ shaft exposes a 3′ vein of quartz inclosed in diorite, and dipping 45° N.E. Richard Powers et al., of Randsburg, owners.

Gilbert Mine (Quartz).—It is on Greenhorn Mountain, 15 miles S.W. of Isabella, at 5,550′ elevation. The vein is 16″ wide, dips 45° E., and contains quartz carrying silver and gold. There is an incline shaft 40′ deep, and some open cuts on the vein. William Gilbert, of Isabella, owner.

Glen Olive Mines (Quartz).—This group is on Badfish Creek, 9 miles N.E. of Havilah, and embraces seven claims. Development consists of three tunnels, 100′, 150′, and 200′ long, on the vein. The vein is 6″ to 9′ wide, and the quartz contains a heavy percentage of sulphurets. Wales L. Palmer, of No. 237 First Street, San Francisco, owner.

Golden Mine (Quartz).—It is 7 miles E. of Caliente, and consists of a 35′ tunnel driven into a mass of quartz, 100′ in width. J. B. Ferris, of Caliente, owner.

Goler Consolidated Placer and Hydraulic Co.'s Mines (Dry Placer).—They lie in the vicinity of Goler. A large ditch, taking water from Owens River, was projected. It was to bring 1,000 cu. ft. of water per second into the desert for the purpose of washing the extensive gravel beds near Goler. The project was abandoned, owing to lack of funds.

Goler District.—See our XIIth Report, p. 456, for a detailed description. It lies 45 miles N. of Mojave, in the hills bordering the desert on the east. Dry-washing is still being prosecuted in a small way, and it is stated that wages of $1 to $1 50 per day can be made with a good machine. The following claims are being worked:

Bald Eagle No. 1	Owned by Frank Nugent, of Mojave.
Bald Eagle No. 2	Owned by Robert Witcher, of Randsburg.
Cincinnati	Owned by M. R. Williams, of Randsburg.
Exchange	Owned by Arch. Martin, of Randsburg.
Lookout	Owned by Alf. Heath, of Randsburg.
Racket	Owned by Gunnison et al., of Randsburg.
Rattler	Owned by D. C. Kuffel, of Randsburg.
Sandturtle No. 1	Owned by Kuffel & Harkins, of Randsburg.
Sandturtle No. 2	Owned by E. Baker, of Randsburg.

The claims all lie within a square mile around Goler. About twelve dry-washer machines are in use.

Good Luck Mine (Quartz).—It is near the Long Tom, 23 miles N.E. of Bakersfield, at 1,450′ altitude. The vein occurs in granite, is 8″ thick, and dips 45° N. A 200′ tunnel and a 60′ and a 70′ shaft on the vein constitute the development. The ore is treated in a horse-power arrastra. A. P. Tucker, of White River, Tulare County, owner.

Green Mine (Quartz).—It is near Kern River, 4 miles S. of Isabella, at 2,420′ elevation. A 150′ shaft, with short drifts at the bottom, has been sunk on an 8″ vein of quartz, dipping 75° E. in granite. T. N. Stebbins, of Isabella, owner.

Grizzly Mine (Quartz).—See our XIIth Report, p. 144. It is on Grizzly Gulch, 4 miles S.E. of White River, at 1,410′ altitude. Only shallow surface work has been done since our last Report. George Duffy et al., of San Francisco, owners.

Hanover Mine (Quartz).—See our XIIth Report, p. 144. It is on Cottonwood Mountain, 6 miles N.E. of Piute, at 5,880′ altitude. The vein is 8″ thick, and dips 45° S. between granite walls. A new tunnel, 150′ long, has been driven on the vein, and some stoping done. The quartz is crushed in a horse-power arrastra. Robert Paehlig, of Piute, owner.

Haight Mine (Quartz).—It is 4 miles E. of Havilah. Idle.

Hardtack (*Dreadnaught*) *Mine* (Quartz).—See our XIIth Report, p. 143. It is in Grizzly Gulch, 4 miles S.E. of White River, at 1,340′ altitude. There are five shafts, from 25′ to 90′ deep, on this claim. A cross-cut drain tunnel is being driven. It is 300′ long, and has not cut the vein yet. The country rock is granite, and the vein varies from 6′ to 36′ in thickness, dipping 45° S.E. Thomas Kitchen, of White River, Tulare County, owner.

Harrison Mine (Quartz).—See Mammoth.

Harvest Home Mine (Quartz).—It is 2 miles S. of White River, at 2,250′ elevation, and is a new location on an 8″ quartz vein between vertical granite walls. James Beaver, of White River, owner.

Hattie and Isabella Mines (Quartz).—They lie near the Long Tom, 25 miles N.E. of Bakersfield, at 1,700′ elevation. Idle. L. S. Johnston, of Visalia, owner.

Hawkeye Mine (Quartz).—It lies 2¾ miles S.E. of Randsburg, at 3,100′ altitude, and is one of the new discoveries in the desert. A 12′ shaft has been sunk on a 2′ vein, dipping 45° N.E., and lying between diorite walls. P. O. Fifield, of Randsburg, owner.

Hector Mine (Quartz).—See Ashford.

Henrietta Mine (Quartz).—See our XIIth Report, p. 144. It lies near Amalie, 18 miles N. of Caliente. Idle.

Hillside Mine (Quartz).—It is in the "slate range," 5 miles S.W. of White River, at 1,250′ altitude, and is an extension of the Sunset. The vein is being traced on the surface. P. C. Montgomery, of Porterville, owner.

Hooper & Tibbetts's Custom Mill is at Isabella, at 2,350′ elevation. Its 5 stamps, of 750 lbs. each, are driven by a 24″ turbine with water taken from Kern River. Hooper & Tibbetts, of Isabella, owners.

Hubbard Mine (Quartz).—See our XIIth Report, p. 145. It is 4½ miles N.E. of Piute, at 4,700′ elevation. Idle. J. B. Ferris, of Caliente, owner.

Ida Mine (Quartz).—It is on Greenhorn Mountain, 8 miles N.W. of Havilah, at 5,600′ altitude. The vein is 20″ thick, and dips 45° S.E. between granite walls. It is developed by a 40′ and a 75′ shaft. The quartz is crushed in a horse-power arrastra. F. F. Boettler, of Woody, owner.

Indian Queen Mine (Quartz).—It is on Long Tom Gulch, 27 miles N.E. of Bakersfield, at 1,840′ altitude. A 40′ shaft, with a 30′ drift each way, is sunk on an 18″ vein dipping 45° N. between granite walls. Theodore Wiley, of Bakersfield, owner.

Isabella Extension (Bevel) Mine (Quartz).—It is near the Long Tom, 23 miles N.E. of Bakersfield, at 1,750 elevation. The vein is 10″ wide, and dips 45° N. between granite walls. Developed by a 100′ shaft, with drifts both ways, 80′ long. A. P. Tucker, of White River, Tulare County, owner.

Isian Camp Mine (Placer).—See our XIIth Report, p. 145. It is in Grizzly Gulch, 6 miles S.E. of White River, at 1,140′ elevation, and is worked by ground-sluicing. A. J. Williams, of White River, Tulare County, owner.

Josephine Mine (Quartz).—See our XIIth Report, p. 145. It is in the "slate range," 5 miles S.W. of White River, at 1,320′ altitude. The development consists of a 65′ and a 150′ shaft and some short drifts. The vein is 8′ thick, and shows several small stringers of rich quartz. The dip is 65° N.E., and the wall-rock mica schist. A whim is used for hoisting. F. E. Barette, of White River, Tulare County, owner.

Juan Dosie Mine (Quartz).—See our XIIth Report, p. 145. It is 1½ miles S.W. of Piute, at 3,510′ elevation. It has been idle for some time, but lately drifting from the bottom of the shaft has been resumed. A steam-power arrastra grinds the rock. Sutter & McKay, of Amalie, owners.

Kenyon Mine (Quartz).—It lies 1 mile N.E. of Randsburg, at 3,450′ elevation. It is a new discovery, and lies on the same vein as the Butte. The vein is 4′ wide, and is exposed in an incline shaft 30′ deep. The quartz shows free gold, and is very rich. Kenyon & Sons, of Randsburg, owners.

Keyes Mine (Quartz).—See our XIIth Report, p. 145. It is 9 miles S.W. of Kernville, at 2,310′ altitude. Idle. T. N. Stebbens, of Isabella, owner.

King Solomon Mine (Quartz).—See Ashford.

Little Angel (*Warrington*) *Mine* (Quartz).—It is 1 mile W. of Havilah, at 4,150′ altitude. The lowest and latest workings consist of a 300′ tunnel and a 250′ winze at its end. A shaft being sunk to strike the winze was, in May last, 300′ deep. A small steam hoist is used. The vein is 2′ to 8′ wide, and dips 70° E. in granite. Patrick O'Brien, of Havilah, owner.

Little Blue Mine (Quartz).—It is on Green Mountain, 6½ miles N.W. of Havilah, at 5,200′ elevation, and is a new location. An open cut, 15′ deep, discloses an 8″ vein of quartz showing free gold. The country rock is granite. Frank and Charles Hitchcock, of Woody, owners.

Little Butte Mine (Quartz).—It is 1 mile N.E. of Randsburg, at 3,400′ altitude, and adjoins the Kenyon. It is a new location. Surface cuts are being made to trace the vein. H. C. Ramie et al., of Randsburg, owners.

Long Tom Mine (Quartz).—It is 25 miles N.E. of Bakersfield, at 1,620′ altitude, and embraces the following patented claims: *Antrim*, *Belle*, *Daisy*, *Hirschfeld*, *Lady Langtree*, and *Webb*. The principal developments are on the Lady Langtree ground, where an incline shaft 500′ deep has been sunk. The pay-shoot is 150′ long, lies south of the shaft, and pitches nearly vertically. Above the 300′ level the pay-shoot has been stoped. The 400′ level is 140′ long, and is partly stoped, while the 500′ level is 150′ long, ready to stope. Near the surface the vein is about 16″ wide, while on the 500′ level it is 20′ wide. It dips 45° W. between a diabase foot-wall with 3″ of clay and a granite hanging-wall with 10″ to 12″ of blue clay containing sulphurets. The vein matter is a short-grained, partly crystallized quartz, with 7% sulphurets. The steam hoist has a 16″x 30″ drum, a 7″x 14″ cylinder, and uses a ⅝″ steel rope. A 50 H.P. engine is used for pumping, and to run the fan. About 4,500 gals. of water are raised per day. A 20-stamp mill is partly on the ground. Water for power will be taken from the ditch of the Poso Creek Irrigation Co., which runs about 100′ above the mill. The Daisy is the south extension of the Lady Langtree; the others are locations on small veins about 1,000′ E. of the main shaft. On the Webb ground there are several tunnels, driven on a vein of quartz 6″ to 30″ thick, lying nearly horizontally between granite walls. Herman Hirschfeld, of Bakersfield, owner; D. M. Tressel, of Bakersfield, superintendent.

Lookout Mine (Dry Placer).—See Goler District.

Los Angeles Placer Mining Co.'s Mine (Dry Placer).—See Red Rock District.

Lucky Cuss Mine (Quartz).—See our XIIth Report, p. 297. It is 3 miles S. of White River, at 2,640′ altitude. The vein is 6″ to 8″ thick, and stands vertically between granite walls. There is a 200′ tunnel and a 30′ shaft on the vein. B. Allen, of White River, Tulare County, owner.

Lucky Joe and Sullivan Mines (Quartz).—They are at the head of Caliente Creek, 4 miles N.E. of Piute, at 5,100′ altitude, and are new locations on a very large vein of quartz. A cross-cut tunnel, 80′ long, partly penetrates the vein. The quartz is treated in a horse-power arrastra. W. J. Thornton et al., of Piute, owners.

Mace Mine (Quartz).—See our XIIth Report, p. 146. It is on Pah-Ute Mountain, 6 miles N.E. of Piute, at 6,575′ altitude. Developed by several shafts, 60′ to 80′ deep, connected by drifts. The vein averages 8″, and dips 40° S.E. in granite. Hugh Mann, of Piute, owner.

Magpie Mine (Quartz).—See Ashford.

Mamie Mine (Quartz).—See our XIIth Report, p. 146. It is 5 miles S.W. of Kernville, at 2,460′ elevation. A 300′ tunnel is driven on a 6″ vein of rich quartz, dipping 85° E. in granite. Mrs. Ross, of Kernville, owner.

Mammoth (*Harrison*) *Mine* (Quartz).—It is 7 miles S.W. of Kernville, at 2,440′ elevation, and embraces the *Burdette*, *Little Mammoth*, *Mammoth*, and *Tom Lane* claims. The vein is 10′ thick, with a pay-streak 18″ to 20″ wide near each wall, and dips 85° E. between granite walls. After lying idle for several years the mine is being prospected thoroughly by a series of tunnels on the vein. Fred Tibbetts et al., of Isabella, owners.

Mammoth (*Sovereign*) *Mine* (Quartz).—See our XIIth Report, p. 147. It is 1 mile W. of Havilah, at 4,150′ elevation. Idle. Max Helmes et al., of Havilah, owners.

Marguerite Russell Mine (Quartz).—It is 2 miles S.W. of Havilah, at 3,820′ altitude. The 24″ vein occurs in granite, and dips 85° E. There is a 60′ shaft, with short drifts, and several open cuts on the claim. E. Shipsey & Co., of Havilah, owners.

Maria Mine (Quartz).—It is in Fiddler's Gulch, 1 mile E. of Randsburg, at 3,400′ elevation. It is a new discovery on a 10″ to 24″ quartz vein, dipping 40° S. The incline shaft is 40′ deep. Benson Bros. et al., of Randsburg, owners.

Mariposa Mine (Quartz).—See Olympus.

Mayflower Mine (Quartz).—It is on Greenhorn Mountain, 7 miles N.W. of Havilah, at 5,420′ elevation. The vein is 10″ thick, and dips 40° E. between granite walls. A 56′ and a 90′ shaft are the developments. Joseph Waugaman, of Woody, owner.

Mayflower Gulch Mine (Placer).—It is on Green Mountain, 7 miles N.W. of Havilah, at 5,000′ altitude, and contains 20 acres. Water is taken from Greenhorn Gulch by 2 miles of 2′x 2′ ditch. The gravel is 18″ to 2′ deep, and is worked by ground-sluicing. F. F. Boettler, of Woody, owner.

McClellan Mine (Quartz).—It is on Green Mountain, 7 miles N.W. of Havilah, at 5,700 altitude. The developments consist of two shafts, 80′ and 45′ deep, and a 140′ tunnel. The 24″ vein occurs in granite, and dips 45° S. The quartz is crushed in a steam-power arrastra. C. C. Stockton, of Bakersfield, owner.

McKidny Mine (Quartz).—It is two miles W. of Havilah, at 4,000′ elevation. The vein is 18″ thick, and dips 75° E. between granite walls. There are several shallow shafts on the claim. Idle. T. Candy, of Havilah, owner.

Mesa Mine (Drift).—It lies in the gravel wash below Goler Cañon, 6 miles N.W. of Randsburg. A shaft was sunk to prospect the bedrock, but when a depth of 367′ was reached, water stopped all further progress. The material passed through consists of gravel and bowlders, and carries gold all the way down. The water in the shaft is said to be good, but no use is made of it at present. A whim was used for hoisting. D. C. Kuffel et al., of Randsburg, owners.

Miranda Mine (Quartz).—See Ashford.

Missouri (*Sarah Tucker*) *Mine* (Quartz).—It is in the "slate range," 5 miles S.W. of White River, at 1,170′ elevation, and is a vertical contact vein between granite on the east and mica schists on the west. The vein is 6″ thick, and is developed by a 75′ tunnel and a 12′ and a 40′ shaft. P. C. Montgomery, of Porterville, owner.

Monarch Mine (Quartz).—It lies at the head of Caliente Creek, 4 miles N.E. of Piute, at 5,000′ altitude. The 12″ vein lies in granite, and dips 80° S.E. There is a 60′ shaft connecting with a 150′ tunnel. W. J. Thornton et al., of Piute, owners.

Mooers Mine (Quartz).—See Olympus.

Morning Mine (Quartz).—It is at the head of Caliente Creek, 4 miles N.E. of Piute, at 5,250′ elevation. A 30′ shaft is sunk on a 12″ to 20″ vein, which dips 45° S.E. between granite walls. W. J. Thornton, of Piute, owner.

Nancy Hanks Mine (Quartz).—See Olympus.

New York Mine (Dry Placer.)—See Red Rock District.

New World Mine (Quartz).—It is 1 mile W. of Havilah, at 4,230′ altitude, and contains an 8′ vein dipping 70° E. The development consists of a 105′ shaft, and a cross-cut tunnel, to be 400′ long, has been started. G. Miller and J. B. Coulston, of Havilah, owners.

None Such Mine (Quartz).—See our XIIth Report, p. 146. It is in Grizzly Gulch, 4 miles S.E. of White River, at 1,440′ elevation. Rock is being extracted from near the surface and treated in a horse-power arrastra. A. R. Sorrells, of White River, Tulare County, owner.

Olympus Mines (Quartz).—This group lies ½ mile E. of Randsburg, at 4,450′ elevation, and comprises the *Big Horse*, *Burcham No. 1 and No. 2*, *California*, *Mariposa*, *Mooers*, *Nancy Hanks*, *Olympus*, *Rand*, *Singleton*, *Tennessee*, and *Trilby*. Gold was discovered in the Randsburg Hills in the spring of 1895, and this group contains the first locations. The veins are large and very rich, but owing to the want of milling facilities very little work has been done. There seems to be two parallel veins, about 600′ apart, with quite a number of small stringers running at right angles between. The strike of the large vein is N.E. and S.W., and the dip 26° N.W. In the Olympus ground an open cut 40′ long and a 7′x14′ incline shaft, 30′ deep, discloses the vein, showing 14′ of dirty-yellow, high-grade quartz. The hanging-wall is diorite; the foot-wall has not been exposed. Several hundred tons of rich ore are sacked, awaiting the mill now being erected at Koehn's, 30 miles away, where a good supply of water (said to be 3 miner's inches) has been obtained in wells. F. M. Mooers et al., of Randsburg, owners.

Ophir Mine (Quartz).—It is 1 mile S.W. of Havilah, at 3,950′ altitude, and is developed by a 100′ tunnel with a winze at its end 100′ deep. The 3′ vein dips 70° S. in granite. A 5-stamp steam-power mill, using 650-lb. stamps and 40-mesh wire screens, belongs to the property. John Hayes, of Havilah, owner.

Oro Fino Mine (Quartz).—It is 2 miles N.W. of Havilah, at 4,310′ altitude. The vein is 18″ thick, and dips 85° E. Development consists of three tunnels, 80′, 150′, and 250′ long, with a winze in the latter, 60′ deep. There is a 300′ irregular upraise to the surface, for air. William Menzel, of Havilah, owner.

Pine Tree Mines (Quartz).—They are on the northern slope of a mountain in Secs. 3 and 4, T. 11 N., R. 15 W., 6 miles S. of Tehachapi, at about 5,000′ altitude, and consist of three connecting claims. The

Olympus Mine.

Randsburg.

vein, of partly decomposed quartz, is 2′ to 10′ wide (average 4′), dips 20° S.E., and is inclosed in decomposed granite. It is principally free-milling, and is worked in an arrastra. The mines are worked through five tunnels, 60′, 80′, 85′, 120′, and 360′ long, respectively. Eight men are employed. W. C. Chormicle, of Tehachapi, owner.

Pinmore Mine (Quartz).—See Ashford.

Pioneer Mine (Quartz).—It is on Kern River, 4 miles S. of Isabella, at 2,320′ altitude. There is a 200′ tunnel on the vein and a 40′ and a 90′ shaft, with drifts in the bottom of the latter 50′ each way. The vein averages 12″ in width and dips 85° S.W. in hard granite. A water-power arrastra belongs to the property. E. Vaughn, of Havilah, owner.

Pluto Mine (Quartz).—It is 2 miles S.W. of Havilah, at 4,200′ altitude. There are three veins on this property, the larger one being 18″ wide and dipping 85° E. in granite. It is developed by a 60′ shaft and a 180′ tunnel. Max Helmes, of Havilah, owner.

Polka Dot Mine (Quartz).—It is on Badfish Creek, 9 miles N.E. of Havilah. Two shallow shafts disclose a 4′ vein, dipping 20° N.E. between granite walls. E. Vaughn, of Havilah, owner.

Pomona Mill and Mining Co.'s Mines (Dry Placer).—See our XIIth Report, pp. 147 and 456. Abandoned.

Portuguese Mine (Quartz).—It is on the stage road, 4 miles W. of Walker. Quartz is taken from near the surface and treated in a horse-power arrastra.

Queen Mine (Quartz).—See Alta.

Racket Mine (Dry Placer).—See Goler District.

Rand Mine (Quartz).—See Olympus.

Rattler Mine (Dry Placer).—See Goler District.

Red Rock District.—Fully described in our XIIth Report, p. 456. It lies in the hills bordering the Mojave Desert, 20 miles N. of Mojave, at 2,300′ elevation. Dry-washer machines are used exclusively, and are said to pay wages. The following claims are being worked by the owners living in Red Rock:

	Men at Work.	Machines.	Owner.
Black & Sullivan	5	2	Black & Sullivan.
Bonanza Group of 11 claims	6	2	J. J. McLaughlin.
Champion	2	1	Sam Le Voy.
Los Angeles Placer Mining Co.	2	1	Jeff Johns et al.
New York	3	1	Hartley & Hawthorn.

Republic Mine (Quartz).—It is 2½ miles S.E. of Randsburg, at 3,150′ altitude. It is a new discovery on the same vein as the Hawkeye. P. O. Fifield, of Randsburg, owner.

Resurrection (*Rochefort*) *Mine* (Quartz).—It is 1 mile W. of Havilah, at 4,220′ altitude. The vein is from 1′ to 7′ wide, and dips 65° S. between granite walls. The development consists of a 120′ shaft with a 150′ drift at its bottom, and a winze 40′ deep at the end of the drift. Max Helmes, of Havilah, owner.

Rip Rap Mine (Quartz).—See Skinner.

Rocket Mine (Quartz).—See Ashford.

Rough and Ready Mine (Quartz).—It is on Greenhorn Mountain, 7 miles N.W. from Havilah, at 5,050′ altitude. The quite extensive older workings are abandoned. A new tunnel run to tap the vein below will be 600′ long, and was, in May, 1896, about 525′ long. The vein carries 12″ of rich quartz. Charles Lamant, of Kernville, owner.

Rustler and San Diego Mines (Quartz).—They lie ¾ mile E. of Randsburg, at 4,650′ elevation. They are new locations on the vein of the Olympus, which they adjoin. A 60′ tunnel is run into a mass or vein of gold-bearing quartz. E. B. Maginnis et al., of Randsburg, owners.

Saginaw Mine (Quartz).—It is 8 miles S. of White River, at 1,290′ altitude, and consists of a vertical 6″ vein between granite walls. On the claim are two 40′ shafts, with short drifts. G. W. King, of White River, Tulare County, owner.

Santa Junta Mine (Quartz).—It is on Long Tom Gulch, 27 miles N.E. of Bakersfield, at 1,920′ altitude. A. Herriera et al., of Bakersfield, owners.

Sandstone Mine (Quartz).—See our XIIth Report, p. 147. It is on Grizzly Creek, 6 miles S. of White River, at 3,600′ altitude. The vertical 6′ vein contains a crushed mass of wall-rock and gold-bearing quartz, striking E. and W. between granite walls. It is developed by a 20′ shaft and a 100′ tunnel. Allen Sorrells, of White River, Tulare County, owner.

Sandturtle Mine (Dry Placer).—See Goler District.

Sarah Jane Mine (Quartz).—See our XIIth Report, p. 147. It is 1 mile N. of Kernville, at 3,050′ elevation. Developed by a 60′ tunnel and a 200′ shaft, from the bottom of which levels extend 200′ S. and 60′ N. The vein is 4″ thick, and dips 80° N.E. Aug. Thede, of Kernville, owner.

Sarah Tucker Mine (Quartz).—See Missouri.

Shoestring Mine (Quartz).—It is 4 miles S. of Isabella, on Kern River, at 2,350′ altitude. The vein is 6″ thick, and dips 85° S.W. in granite. On the vein are a 30′ shaft and several open cuts. Idle. E. Vaughn, of Havilah, owner.

Singleton Mine (Quartz).—See Olympus.

Skinner (*Rip Rap*) *Mine* (Quartz).—See our XIIth Report, p. 147. It is 4 miles N.W. of Piute, at 4,580′ altitude. There is a new 100′ shaft, with two 50′ drifts at the bottom. The vein is 18″ thick, and stands vertically between granite walls. The quartz is treated in a steam-power arrastra. Hugh Mann, of Piute, owner.

Slate Walls Mine (Quartz).—It is 7 miles E. of Caliente. A 60′ shaft and 20′ drift disclose a vein 2′ wide. Orin Barr, of Visalia, owner.

Sovereign Mine (Quartz).—See Mammoth.

Speedy Mine (Quartz).—It is 7 miles S.W. of Kernville, at 2,440′ altitude. A 20″ vein is exposed by a surface cut. Fred Tibbetts, of Isabella, owner.

St. Charles Mine (Quartz).—It is 2 miles N.W. of Havilah, at 4,320′ altitude. The 2″ vein dips 85° E. in granite. A cross-cut tunnel is being extended to 330′, and will cut the vein 200′ below the surface; it is now 180′ long. An old 10-stamp steam-power mill, with 650-lb. stamps, belongs to the property. Pat Reese et al., of Havilah, owners.

Summit District.—Fully described in our XIIth Report, p. 458. It lies in the Mojave Desert, 65 miles N. of Mojave, at 3,300′ altitude. A few men are working in this district with dry-washers. It is said that 75 cents is an average clean-up per man per day.

Sunrise Mine (Quartz).—It is ½ mile S.W. of Havilah, at 3,800′ altitude. The developments consist of a 500′ tunnel and several shorter ones. The 3′ vein dips 85° E. Reese & Co., of Havilah, owners.

Sunset Mine (Quartz).—It is in the "slate range," 5 miles S.W. of White River, at 1,160′ elevation. A 10″ vein, dipping 80° S., is developed by a 130′ tunnel and a shaft now being sunk to meet it. The country rock is mica schist. Joe Mitchell, of White River, Tulare County, owner.

Surplus Mine (Quartz).—It is 10 miles E. of Piute. An 18″ vein is exposed in an open cut and in a short tunnel and shaft. J. B. Ferris, of Caliente, owner.

Sycamore Springs Mine (Quartz).—See our XIIth Report, p. 147. It is on Grizzly Creek, 5 miles S.E. of White River, at 1,300′ elevation. Idle. A. W. Monroe, of White River, Tulare County, owner.

Talc Mine (Quartz).—See our XIIth Report, p. 147. It is 8 miles S. of White River, at 1,340′ altitude. The development consists of a 400′ shaft, a 500′ tunnel on the 200′ level, and a 600′ one on the 300′ level. The vein on the bottom shows 10″ of quartz. The walls are granite and the dip is vertical. The rock is treated in a 3½′ Huntington mill. G. W. King, of White River, Tulare County, owner.

Tennessee Mine (Quartz).—See Olympus.

Three Chimneys Mine (Quartz).—It is 4 miles S. of Isabella, at 2,370′ elevation. An 8″ vein, dipping 75° E. in granite, is being mined in a 400′ tunnel with several short winzes. T. N. Stebbins, of Isabella, owner.

Tip Top Mine (Quartz).—It is 1½ miles W. of Havilah, at 4,460′ altitude. A new location. John Hayes et al., of Havilah, owners.

Tip Top Mine (Quartz).—It is on Caliente Creek, near Amalie, at 2,750′ elevation. There is a 40′ tunnel and a 10′ shaft exposing a 2′ vein dipping 80° S. J. B. Ferris, of Caliente, owner.

Trilby Mine (Quartz).—See Olympus.

Two Oaks Mine (Quartz).—It is 8 miles S. of White River, at 1,390′ elevation. The vein is 6″ thick and is developed by a 40′ shaft. G. W. King, of White River, Tulare County, owner.

Veracity Mine (Quartz).—See our XIIth Report, p. 147. It is 1 mile E. of Claraville. Idle. Barton & Patterson, of Weldon, owners.

Vulture Mine (Quartz).—It is 5 miles S. of White River, at 3,350′ elevation. The vein, dipping 20° S., is from 2′ to 3′ wide, with 6″ to 18″ of quartz, and lies between granite walls. A 340′ tunnel on the vein is stoped to the surface and is being extended. A. R. Sorrell, of White River, Tulare County, owner.

Walker Mine (Placer).—It is on Kern River, 4 miles S. of Isabella, at 2,200′ altitude. Water is taken from French Creek by a 2′ x 2′ ditch, 5 miles long. The gravel is 4′ deep and carries gold throughout. Worked by ground-sluicing. Walker & Sons, of Isabella, owners.

Warrington Mine (Quartz).—See Little Angel.

Wasp Mine (Quartz).—See Ashford.

Water Mine (Quartz).—It is on Kern River, 4 miles S. of Isabella, at 2,400′ altitude. The vein occurs in granite, dips 85° S.W., and is from 6″ to 24″ wide. The developments are a shaft 100′ deep, with a 100′ drift in the bottom. Ore is being extracted at present from the surface in a cut 15′ deep by 200′ long. Paris & Gomez, of Havilah, owners.

White Pine Mine (Quartz).—See our XIIth Report, p. 148. It is on Badfish Creek, 9 miles N.E. of Havilah. The vein averages 24″ wide, and lies in a contact between limestone and granite, and dips 35° S.E.

Developed by a 100′ tunnel. The rock is treated in a water-power arrastra. B. V. Burton, of Kernville, owner.

Williams's Custom Arrastra.—It is on Grizzly Gulch, 4 miles S. of White River, at 1,240′ altitude. It is driven by a 10 H.P. engine, and averages 2½ tons of rock per day. R. A. Williams, of White River, Tulare County, owner.

Williams Mine (Placer).—It is on Fremont Gulch, 9 miles N.W. of Havilah, at 4,800′ altitude, and contains 20 acres. Worked by ground-sluicing. Ben Williams, of Woody, owner.

Wood Mine (Quartz).—It is on Kern River, 4 miles S. of Isabella, at 2,370′ altitude. There are two shafts; one is 70′ deep with a 10′ drift, and the other is 40′ deep with 80′ of drifts. The vein carries 10″ of quartz, and dips 85° S.W. in granite. Paris & Gomez, of Havilah, owners.

Woody Mine (Quartz).—See our XIIth Report, p. 148. It is in the "slate range," 5 miles S.W. of White River, at 1,150′ altitude. Idle. Joe Mitchell, of White River, Tulare County, owner.

Yankee Bullock Mine (Placer).—See our XIIth Report, p. 148. It is on Grizzly Creek, 4½ miles S.E. of White River, and is worked by ground-sluicing. B. L. Tompkins, of White River, Tulare County, owner.

Young America Mine (Quartz).—It is on Kern River, 4 miles S. of Isabella, at 2,250′ elevation. There are many old workings, now idle. The mine is worked from the surface in an open cut, 15′ deep and 1,000′ long. The vein averages 8″ in thickness, and dips 87° S.W. between granite walls. Frank Potts and William James, of Havilah, owners.

MILLS IN KERN COUNTY.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of Each, in Lbs.	Capacity per 24 Hrs., in Tons.
Bartons	Steam	5		
Big Blue*	Water	80	850	
Garlock	Steam	8	750	3
Hooper & Tibbetts	Water	5	750	8
Iconoclast†		5	850	8
Long Tom	Water	20	850	15
Ophir	Steam	5	650	6
St. Charles	Steam	10	650	

* Has 16 concentrators.

† Cyanide plant, 10 tons daily capacity.

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN KERN COUNTY.

Name of Mill or Mine.	Power.	Number	Character.	Diameter	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
						No.	Character.	No.	Capacity.		
Amalie	Steam	1	Huntington	5′	16	2 1	Frue Woodbury				
Dead Tree	Horse		Arrastra		1						
Goler District		12	Dry-Washers								
Good Luck	Horse		Arrastra		1						
Hanover	Horse		Arrastra		1						
Ida	Horse		Arrastra		1						
Juan Dosie	Steam		Arrastra		1½						
Lucky Joe	Horse		Arrastra		1						
McClellan	Steam		Arrastra		1½						
None Such	Horse		Arrastra		1½						
Pioneer	Water		Arrastra		1						
Pine Tree		2	Arrastra		10						
Portuguese	Horse		Arrastra		½						
Red Rock District		7	Dry-Washers								
Skinner	Steam		Arrastra		1						
Summit District			Dry-Washers								
Talc	Steam	1	Huntington	3½′							
White Pine	Water		Arrastra		1						
Williams	Steam		Arrastra		2½						

CUSTOM WORKS IN KERN COUNTY.

Garlock. (No data.)											
Williams			Arrastra								

Lassen County.

Afterthought Mine (Quartz).—See our Xth Report, p. 274. This is situated about 2 miles W. of Susanville, at about 4,600′ elevation. The 1,500′ by 600′ location carries an E. and W. vein between decomposed granite walls about 12′ wide. Idle.

Blue Bell Mine (Quartz).—See our IXth and XIIth Reports, pp. 213 and 148. This mine is situated on Hayden Hill, at 6,400′ elevation. The two veins vary from a few inches to 2′ wide, and course N. and S. and E. and W., crossing each other in a quartzite and breccia formation. The former vein pitches about 45° E. At the crossing the vein carries several narrow streaks of an ochery clay, said to yield $4 per pound. A 3′x 4′ vertical shaft has been sunk about 100′, and a cross-cut run to the vein and a winze started on the crossing. The hoist is a horse-whim. Ore has to be hauled 2½ miles to an arrastra on Willow Creek. Two men are at work. Preston & Howard, of Hayden Hill, owners.

Brush Hill Mine (Quartz).—See our Xth, XIth, and XIIth Reports, pp. 276, 241, and 148. It is situated on Hayden Hill, at 6,500′ elevation. Since our last Report, a 4½′x 5′ shaft has been sunk over 400′ deep west of the previous workings; 270′ vertically and then following 130′ on an incline. From the bottom, 80′ of cross-cut was run easterly to strike the vein. The ore is hoisted by a horse-whim and hauled 3 miles, at an expense of $1 per ton, to a small 5-stamp water-power mill. Two loads, of 6 tons each, are hauled per day. Eight men are employed. Frank Vander Elst et al., of Hayden Hill, owners; G. T. Stone, of Hayden Hill, superintendent.

Evening Star Mine (Quartz).—See our Xth and XIIth Reports, pp. 276 and 149. Altitude, 6,400′. Since our last Report, the mine has changed owners. Idle. — Schloesser et al., of Chicago, owners.

Gold Belt Mine (Quartz).—See our Xth and XIIth Reports, pp. 274 and 149. Idle.

Golden Eagle Mine (Quartz).—See our Xth and XIIth Reports, pp. 275 and 149. It lies on the east side of the town of Hayden Hill, at 3,400′ elevation. Since our last Report no further exploitations have been made; the block of ground west from the 220′ level to the bottom has been blocked out and stoped, with some little stoping east of the shaft. A new gasoline hoisting-engine of 6 H.P. is to replace the horse-whim. A 32′x 24′ canvas plant has been added to the mill·on Willow Creek. The company employs 8 men. — Schloesser et al., of Chicago, owners.

Golden Gate Mine (Quartz).—See our Xth Report, p. 274. This is about 5 miles S.W. from Susanville, at 4,800′ elevation. Idle. G. Branham et al., of Susanville, owners.

Gopher Hill Mine (Quartz).—See our XIIth Report, p. 150. It is ¼ mile S. from Hayden Hill, at 6,300′ elevation. The vein courses E. and W. Work is carried on spasmodically. "Hand-mortar ore" is found here. Three men are at work. T. Jones and W. Dale, of South Fork, Modoc County, owners.

Gray Eagle Mine (Quartz).—See our Xth Report, p. 274.

Hayden Hill Cons. Tunnel Co.'s Mine (Quartz).—See our XIIth Report, p. 150. It is ½ mile E. from Hayden Hill, at 6,200′ elevation, and embraces a tunnel-right and four mining locations. Since our last

Report, the tunnel has been advanced 275′, making it 1,300′ long, and costing a little over $3 per foot; it has cut no large quartz bodies to date. A gasoline-engine and Sturtevant blower, with wooden air-boxes, have been erected to furnish air and enable the tunnel to be continued. Five men are at work. An incorporated company of Bieber, owner; J. McCoy, of Adin, Modoc County, superintendent.

Hayseed (*Don't Care*, *Uncle Billy*) *Mine* (Quartz).—See our XIIth Report, p. 151. It is about ¼ mile from Hayden Hill, on the east side of the hill, at 6,300′ elevation. A horse-whim has been erected and the shaft at the north end of the claim continued; some very high-grade ore was obtained in drifting westerly. A 10-stamp steam-power mill is in course of erection. Four men are employed in the mine. S. Owen, — Perrault, and J. White, of Hayden Hill, owners.

Juniper Mine (Quartz).—See our IXth and XIIth Reports, pp. 212 and 150. It is situated on the west side of Hayden Hill, at 6,325′ elevation. Lessees have sunk the shaft to a depth of 400′ and drifted under the old workings, but without developing anything of importance. Idle. J. McFarling et al., of Calistoga, Napa County, owners.

Lone Pine Mine (Quartz).—It is on the east flank of the Diamond Mountain range, about 6 miles S.W. from Susanville, at 4,200′ average elevation, and contains two full claims on a 4½′ vein trending N.W., and dipping nearly perpendicularly in a granitic formation. This is a late discovery, and a shaft has been sunk 100′ on the vein and short drifts run. A 10-stamp mill has been erected, to be driven by a 50 H.P. steam-engine. Timber and water are plentiful and convenient. Sixteen men are employed. Judge J. Goodwin et al., of Quincy, Plumas County, owners.

North Star (*Fluent*) *Mine* (Quartz).—See our XIIth Report, p. 151. It is situated north of the town of Hayden Hill, at 6,450′ elevation, and is an extension of the Evening Star. Near the middle of the claim, the N. and S. vein has been excavated a couple of hundred feet in length and 30′ in depth. Lately a shaft has been sunk 50′ on the south end of the claim to prove a vein of low-grade ore, but operations had to be suspended on account of water. The ore taken from the cut is of good grade. Three men are at work. W. T. Summers, of Hayden Hill, owner.

MILLS IN LASSEN COUNTY.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of Each, in Lbs.	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
					No.	Character.	No.	Capacity.		
Brush Hill	Water	5	650	5						
Evening Star	Water	5	650	7½						
Golden Eagle*		10	650	12						768 sq. ft.
Hayseed		10	750							
Lone Pine		10								

In addition to stamps, the mills marked with a * have additional crushing capacity, as noted in the following list:

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN LASSEN COUNTY.

Name of Mill or Mine.	Power.	Number	Character.	Diameter	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
						No.	Character.	No.	Capacity.		
Blue Bell	Water		Arrastra		1						
Golden Eagle		1	Arrastra								
Juniper			Arrastra								

Los Angeles County.

In and near the Cedar Mountain Mining District there are eight mines in operation and three quartz mills have been erected. On Mount Gleason there are sixteen claims, and 3 miles N.W. of Acton two claims in which assessment work is regularly done. At and near the same localities there are many hundreds of claims which receive more or less attention at the hands of their owners. During 1895–96 twenty-five iron mines were located in the San Gabriel Mountains along the line of the proposed Salt Lake and Los Angeles Railroad. In the Soledad placers during 1895–96 but little work was done, owing to the small rainfall and to the fact that dry-washers did not prove remunerative. In the placer mines north of Newhall, mining has been carried on to a limited extent. Some mines are being operated on North Bald Mountain in the St. Anthony Mining District, about 28 miles E. of Palmdale, and the work has been principally development. A company has been organized to work auriferous sand on the seashore near Ballona.

Allen's North American Reduction Works are situated at Jefferson Street and Raymond Avenue, Los Angeles. The plant consists of one Allen's 50 H.P. boiler; one 4″ Allen's crusher, of 10 tons capacity in twenty-four hours; one Allen's dry concentrator, of 40 tons capacity in twenty-four hours. Four men are employed. D. Allen, of No. 635 Hill Street, president; G. G. King, of No. 223 N. Los Angeles Street, manager.

Big Horn Mine (Quartz).—It is on North Bald Mountain, 28 miles E. of Palmdale. The developments consist of about 1,000′ of tunnels. Free-milling rock ore on surface and sulphurets below. Development work only. Three men are employed. Vincent, Delaney & Lockwood, owners; J. Lockwood, of No. 847 Buena Vista Street, Los Angeles, secretary.

Black Cat Mine (Quartz).—It lies 10 miles E. of Acton, at about 3,500′ elevation. Developments consist of about 2,000′ feet of open cuts, shafts, and tunnels. A 20-stamp water-power mill is connected with the mine. Twelve men are employed in development work. Pierson, Bell & Stamp, owners; J. Pierson, of Acton, superintendent.

Buena Esperanza Mine (Quartz).—It is 2 miles N.W. of Acton. There are three shafts, 50′, 80′, and 30′ deep. Six men are employed in development work. W. L. Hastings, of Acton, owner.

Cahuenga Mine (Quartz).—It is 7 miles N. of Los Angeles. There are four tunnels, 30′ to 75′ long, and two 20′ shafts. Assessment work only. Cahuenga Mining and Irrigation Co., owner; H. J. Lloyd, of No. 428 Byrne Building, Los Angeles, secretary.

Called Back Mine (Quartz).—On North Bald Mountain, 28 miles E. of Palmdale. Development work consists of several hundred feet of tunnels. Three men are employed. T. Carey and N. D. Shippey, owners; Thomas Carey, of No. 851 Buena Vista Street, Los Angeles, secretary.

Cornet Mines (Quartz).—These adjoining mines are 4 miles N.W. of Acton. There are two 250′ tunnels and a 40′ shaft. Three men are employed. T. H. Webb, of New York, owner; J. Flood Walker, of Acton, superintendent.

Eagle Mine (Quartz).—See our XIIth Report, p. 152. It is a patented claim 7 miles S. of Acton. There are two 50′ tunnels and two shafts, 60′ and 100′ deep. The ore is free-milling on the surface; sulphurets below. A 5-stamp mill is on the ground. Work suspended in 1896, owing to an accident to the machinery. F. Mackey et al., of Wilson Block, Los Angeles, owners.

Hawley, Drinkwater & Hansen Mines (Quartz).—They are on Mount Gleason, about 8 miles from Acton, and comprise the *Bob Ingersoll*, *Bolney*, *Fraction*, *Freethinker*, *Gold Bullion*, *Golden Rule*, *Log Cabin*, and *Old Town* claims. Assessment work only. Hawley, Drinkwater & Hansen, of Acton, owners.

Kelly's Mines (Quartz).—They are on Mount Gleason, about 7 miles from Acton, and comprise the *Champion*, *Last Chance*, and *Padre*. Assessment work only. T. Kelly, of Acton, owner.

Kelsea Mine (Quartz).—It is situated 5 miles N. of Azusa, and the ore carries both gold and silver. There is a 5-stamp steam-power mill in connection with the claim. San Gabriel Mill and Mining Co., owners; Charles Kellogg, of Azusa, superintendent.

Mammoth Mine (Quartz).—It is 3 miles N.W. of Acton. Assessment work only. S. B. Savage, of Acton, owner.

Monte Cristo Mines (Quartz).—They comprise the *Dos Robles*, *Mikado*, *Monte Carlo*, and *Monte Cristo*, and are in Tajungo District, 16 miles E. of Acton, at approximately 4,700′ altitude. The developments consist of five tunnels, 5′ to 30′ long, and three shafts, 10′ to 40′ deep. The rock is crushed in a 4-stamp mill, with 600-lb. stamps, and a 5′ Huntington mill. Two of these mines yield free-milling ores and two of them sulphuretted ores. Five men are employed, prinicipally on development work. R. E. Hudson et al., of Acton, owners.

Pacific Beach Mining and Dredging Co.—This company has been organized in Los Angeles to work, by amalgamation, auriferous sand on the seashore near Ballona, 4½ miles S. of Santa Monica. It is said that more than one hundred shafts, 5′ to 20′ in depth, have been sunk, proving the beach to consist of strata of gray sand, 3″ to 6″ in thickness, and black sand 2″ to 2′ in thickness. It is claimed that both the gray and the black sand are auriferous. H. F. Parker, of Los Angeles, secretary.

Peabody & West's Mines (Quartz).—They are on Mount Gleason, about 8 miles from Acton, and comprise the *Gold Ribbon*, *King of Gleason*, *Silent Friend*, and *White Cloud* claims. Assessment work only. Peabody & West, of Acton, owners.

Red Rover Mine (Quartz).—See our XIIth Report, p. 153. It is 3 miles N.W. from Acton, at approximately 3,310′ altitude. There is a 250′ tunnel and a 535′ incline. The plant consists of a steam hoist and a 10-stamp steam-power mill. Seventeen men are employed. H. T. Gage & Co., of Los Angeles, owners; Joseph Gilbert, of Acton, superintendent.

Sierra Madre Silver Mining Co.'s Mine (Quartz).—It is situated 5 miles N. of Azusa. It is worked through three tunnels, 200′ to 700′ in length, and two shafts, 50′ and 25′ deep. One small shipment of ore was made in 1895. Col. M. R. Vernon, of Los Angeles, president.

Tajungo Group of mines consists of the *Baltic*, *Boston*, *California*, *Los Angeles*, *Nevada*, and *Pacific*, and lie 16 miles E. of Acton, at about 4,700′ altitude. Developments consist of about 1,000′ of tunnels and numerous shafts. Two men are employed on development work. Output small. Hutchinson & Fuller, owners; E. H. Fuller, of Acton, superintendent.

Triumph Mine (Quartz).—It is 6 miles N.W. of Acton. There is a 240′ tunnel and a 25′ shaft. Two men are employed on development work. W. L. Hastings, of Acton, owner.

Victoria Mine (Quartz).—It is situated 5 miles N. of Azusa. The plant consists of a 10-stamp water-power mill. Victoria Mining Co., of London, England, owner; C. A. Sumner, of Broadway, Los Angeles, agent.

Whitter Mine (Quartz).—It is 3 miles N.W. of Acton. Assessment work only. C. L. Wilson, of Acton, owner.

MILLS IN LOS ANGELES COUNTY.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of Each, in Lbs.	Capacity per 24 Hrs., in Tons.
Kelsea	Steam	5		
O'Rielly	Steam	5	1,000	10
Red Rover	Steam	10	800	
Victoria	Steam	10		

Madera County.

This county, while possessing a number of gold mines of undoubted value, has suffered a severe reaction in its mining industry of late years by reason of ill-advised investment, or insufficient capital to complete necessary development or to furnish the proper equipment of machinery. Formerly large amounts of gold were shipped from mines in this county, at the time it was a portion of Fresno. The most famous of these were the Fresno Enterprise, on Potter Ridge; the Josephine and the Gambetta, at Grub Gulch; the Abby, near Hildreth; the Lily, near O'Neals, and numerous other less prominent mines. In looking over the county quite a number of promising prospects were found which apparently only require a reasonable amount of money and a practical knowledge of mining to place them on a paying basis. The greatest mineral industry at present is undoubtedly granite-quarrying near Raymond, described under head of "Structural Materials" in this Report. These quarries are reputed to be the finest in the world.

Abby Mine (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 202, 194, and 154. It is at Hildreth. Idle. George W. Grayson, of San Francisco, owner.

Achsah D. Mine (Placer).—It is in Fine Gold Gulch, 6 miles S. of Hildreth. C. B. Halstead, of Pollasky, owner.

Albion Mine (Quartz).—It is 2 miles E. of Gold Gulch. Only slightly developed. T. Keef et al., of Gold Gulch, owners.

Alexandra Mine (Quartz).—It is near Gold Gulch. Only superficially developed. L. Krohn, of Gold Gulch, owner.

Alpha No. 2 Mine (Quartz).—It is in Potter Ridge District, and has an 80′ incline. Waterloo Gold Mining Co., of San Francisco, owner.

Alvarita Mine (Quartz).—It is near Hildreth. Only superficial development of an 18″ vein. A. E. Snow et al., of Fresno, owners.

Aurora Mine (Quartz).—It is in Potter Ridge District. F. Dirks, of Gold Gulch, owner.

Baltimore Mine (Quartz).—See our XIIth Report, p. 154. It is on Jackass Mountain. Idle. Smith Norris, of Fresno, owner.

Banderita Mine (Quartz).—It is near Hildreth. D. Pray et al., of North Fork, owners.

Bazinet Mine (Quartz).—See Morrow.

Beaumont Mine (Quartz).—It is 1 mile S.E. of Grub Gulch, and has a 240′ tunnel on the vein. Charles M. Ward, of Grub Gulch, owner.

Bellevue Mine (Quartz).—See our XIIth Report, p. 154. It is 5 miles S.W. of Hildreth. Mr. Besone, of Gold Gulch, owner.

Berry Mine (Quartz).—See our XIIth Report, p. 154. It is near Hildreth, and has three shafts, 60′, 70′, and 140′ deep, on a vein in granite. L. V. Loomis et al., of Hildreth, lessees.

Bessie H. Mine (Quartz).—It is in Fine Gold Gulch, 5 miles S.W. of Hildreth. E. Wright, of Pollasky, owner.

Blind Orphan Mine (Quartz).—See our XIIth Report, p. 154. It is on Jackass Mountain. G. D. Hitchcock et al., of Madera, owners.

Bowlder Mine (Placer).—It is on Fine Gold Creek, in Sec. 26, T. 9 S., R. 21 E. J. M. Bowles, of Hildreth, owner.

Buena Ventura Mine (Quartz).—It is in Potter Ridge District. Theo. Strombeck, of Gold Gulch, owner.

Bullion Mine (Quartz).—It is at Grub Gulch. The vein dips W. in magnesian schists, which dip E. In width the vein is from 3″ to 18″, and is accompanied by a narrow sheet of intrusive rock. A tunnel has been driven 200′ on the vein. A number of surface cuts have been made on the vein, and a cross-cut tunnel has intersected it 50′ below the croppings; drifts have been run a short distance each way and a 20′ winze sunk. The long tunnel is now being driven forward to reach a point under the winze. C. M. Ward et al., of Grub Gulch, owners.

Burney Mine (Quartz).—See our XIIth Report, p. 154. It is in Potter Ridge District. There are three shafts, 70′, 100′, and 180′ deep. Idle. D. McLellan et al., of Gold Gulch, owners.

Butterfly Mine (Quartz).—See our XIIth Report, p. 155. It is ¾ mile W. of Savannah, and prospected by four tunnels 100′ above one another. The 14″ vein courses N. 50° W., and dips 50° N.E. A. W. Poole, of Grub Gulch, owner.

Caledonia Mine (Quartz).—It is a prospect in Potter Ridge District. D. McLellan et al., of Gold Gulch, owners.

Caledonia Mine (Quartz).—It is on the north end of Potter Ridge, 5 miles E. of Grub Gulch, and has been discovered and opened since our last Report. It is a 12″ wide fissure in amphibolite schist. A 120′ tunnel exposes high-grade quartz, which contains about 4% of sulphurets. Several other locations have been made on the fissure, but no work has been done on them. C. M. Ward et al., of Grub Gulch, owners.

Canady Mine (Quartz).—It is 6 miles S.W. of Hildreth, and has only superficial development. A. J. Canady, of Pollasky, owner.

Caroline Mine (Quartz).—It is on Swede Gulch, 2 miles N.E. of Gold Gulch. J. Jones et al., of Gold Gulch, owners.

Central No. 2 Mine (Quartz).—It is 2½ miles N.E. of Gold Gulch, on the North Fork of Deadwood Creek. D. McLellan et al., of Gold Gulch, owners.

Chipmunk (*Stargo*) *Mine* (Quartz).—It is 1 mile N.W. of Hildreth. D. L. Pray, of North Fork, owner.

Cliff Mine (Quartz).—See our XIIth Report, p. 155. It is on Jackass Mountain. Idle. P. Ralph, of North Fork, owner.

Colorado Mine (Quartz).—It is 2 miles E. of Gold Gulch. Only slightly developed. D. McLellan et al., of Gold Gulch, owners.

Columbus Mine (Quartz).—It is 5 miles E. of Gold Gulch. Morrison & Nimes, of Gold Gulch, owners.

Combination Mine (Placer).—It is on Fine Gold Creek, in Sec. 25, T. 9 S., R. 21 E. J. W. Stratham, of Hildreth, owner.

Common Gold Mine (Quartz).—It is 7 miles S.W. of Grub Gulch, on Spangle Gold Gulch, and has a shaft 140′ deep. Flooded. P. Reddy, of San Francisco, agent.

Contention (*Rough and Ready*) *Mine* (Quartz).—See our XIIth Report, p. 155. It is at Hildreth. T. Keefe et al., of O'Neals, owners.

County View Mine (Quartz).—See our VIIIth Report, p. 213. D. McLellan, of Gold Gulch, owner.

Crab Tree Mine (Quartz).—It is a prospect on the North Fork of Fine Gold Creek. T. Jones, of Gold Gulch, owner.

Cross and Crescent Mines (Quartz).—These are near Gold Gulch, and have only superficial development. G. Conkin et al., of Gold Gulch, owners.

Crystal Spring Mine (Quartz).—See our VIIIth Report, p. 214. It is 2½ miles N.E. of Grub Gulch. It consists of the following locations: *Crystal Springs*, *Investigation*, *Red Rover*, and *Southwestern*. The vein, about 2′ wide, courses N.E. and S.W., and dips 50° E., in slate. Idle. Chas. Knox, of Oakland, owner.

Dagmar Mine (Quartz).—It is in Potter Ridge District. C. Petersen et al., of Gold Gulch, owners.

Daniels Mine (Quartz).—It is at Hildreth. Developed superficially. E. R. Daniels et al., of Pollasky, owners.

Defiance Mine (Placer).—It is at the "old adobe crossing" of the San Joaquin River. J. Petersen, of North Fork, owner.

Diana Mine (Quartz).—See our XIIth Report, p. 156. W. R. Hampton, of Pollasky, owner.

Eighty-four Mine (Quartz).—It is in Potter Ridge District. D. R. McKenzie et al., owners.

Eighty-six Mine (Quartz).—It is 3 miles W. of O'Neals. The property comprises a group of eight claims. With the exception of the *Eighty-six* and *Lucky Boy* claims, they have only superficial development. The Eighty-six claim has an incline, 150′ deep, and several smaller shafts and open cuts, on each of two veins which cross near the main shaft. A steam hoist is being set up at this shaft, and mining operations are to be resumed. The Lucky Boy claim has a 50′ shaft. J. C. Beck et al., of O'Neals, owners.

Eliza Jane Mine (Quartz).—See our XIIth Report, p. 156. It is 1 mile E. of Hildreth, and opened by an 80′ incline and five tunnels of various lengths. Idle. P. Bazinet, of Hildreth, owner.

Empire Mines, Nos. 1, 2, and 3 (Quartz).—These are 3 miles S.W. of Grub Gulch, on a narrow but rich vein in granite. The developments consist of a 50′ tunnel and two shafts, 80′ and 130′ deep, respectively. The quartz is worked in arrastras. Lovely Bros., of Grub Gulch, owners.

Europa Mine (Quartz).—It is 3½ miles S.W. of Grub Gulch, on the Empire vein, and has a 180′ incline. G. Pendola, of Grub Gulch, owner.

Fine Gold Mine (Quartz).—It is 3½ miles N.E. of O'Neals. Mark Anderson, of O'Neals, owner.

Fine Gold Mine (Placer).—It is near Hildreth. J. Kirby, of Hildreth, owner.

First Venture Mines (Quartz and Placer).—They are 2 miles W. of Hildreth. J. L. Baker, of O'Neals, owner.

Five Oaks Mines (Quartz).—See our XIIth Report, p. 156. This group consists of *Alpha No. 1*, *Eclipse*, and *Sydney*, in the Potter Ridge District. Prospected by two tunnels, 170′ and 400′ long, and two shafts, 70′ and 40′ deep. The 25′ vein dips 35° N.E. Five Oaks Mining Co., of San Francisco, owner.

Flying Dutchman Mines (Quartz).—This property is 2 miles N.W. of Gold Gulch, and comprises six claims on one fissure or zone. Surface cuts and shafts have proven the vein at a number of points; the deepest inclines being 60′, 100′, and 150′, respectively. The vein, consisting almost wholly of quartz, is much crushed, but, as far as observed, not dislocated. The quartz carries iron sulphurets. There is no machinery on the property, but it is currently reported that the mines are to pass into other hands, and extensive development commenced at once. Mrs. L. Krohn, of Gold Gulch, owner.

Fresno Banner Mine (Quartz).—It is near Hildreth. J. Donohue et al., of Fresno, owners.

Fresno Enterprise Mine (Quartz).—See our XIIth Report, p. 156. It is 5 miles E. of Grub Gulch. Idle. J. Coats, of Pasadena, Los Angeles County, owner.

Gambetta (*Arkansas Traveler*) *Mines* (Quartz).—See our Xth Report, p. 197. It is 14 miles S. of Raymond, in Potter Ridge District, at 2,150′ elevation. This mine was reopened in the fall of 1895, after an idleness of several years. The vein is small, but the quartz is high-grade. The mine has a steam hoist and Huntington mill. Murray & Mills, of Grub Gulch, owners.

Grand Central Mine (Quartz).—It is 2 miles N.E. of Gold Gulch, and is a prospect only. D. McLellan et al., of Gold Gulch, owners.

Greaser Gulch Mine (Quartz).—It is on Greaser Gulch, 2½ miles N.E. of Gold Gulch, and has a small vein of rich quartz, which is crushed in an arrastra. J. S. Lingo, of Gold Gulch, owner.

Great Eastern Mine (Quartz).—It is near Gold Gulch. D. McLellan et al., of Gold Gulch, owners.

Hall Mine (Placer).—It is on the North Fork of the San Joaquin River. W. Hall, of North Fork, owner.

Hallangshead Mine (Quartz).—It is 9 miles E. of Pollasky, near the San Joaquin River. The vein, 4″ to 2′ in width, strikes N.E. and dips 30° N.W. A 130′ incline has been sunk on the vein. The formation is granite. E. Hallangshead, of Pollasky, owner.

Hanover Mine (Quartz).—See our VIIIth Report, p. 204. A new tunnel has recently been run to cut the vein. It has a steam hoist and 5-stamp mill. H. S. Williams, of Madera, owner.

Harrietta Mine (Quartz).—See our XIIth Report, p. 157. It is on Swede Gulch, 2 miles N.E. of Gold Gulch. D. McLellan et al., of Gold Gulch, owners.

Hawkeye Mines (Quartz).—They are 2 miles N.E. of Gold Gulch, and comprise a group of six claims. There is a tunnel, 250′ long, on the Hawkeye claim. The other claims have shallow shafts, cuts, etc.

When in active operation the quartz from these claims is hauled in wagons to the company's 5-stamp mill, on Deadwood Gulch. Hawkeye Mining Co., of Gold Gulch, owner.

Henrietta Mine (Quartz).—See our XIIth Report, p. 157. It is in Sec. 14, T. 10 S., R. 21 E., and on Fine Gold Creek. It is exploited by short tunnels and shallow shafts. J. A. Harris et al., of Pollasky, owners.

Hesper Mine (Placer).—It is near Hildreth. J. P. Newman, of Hildreth, owner.

Hildreth (*Volcano No. 2*) *Mine* (Quartz).—It is at Hildreth. The vein occurs in hornblende schist, and lies quite flat. The shafts, 200′ and 400′ deep respectively, have been sunk on the vein, and considerable surface work and stoping done. It is now idle. Estate of William Dunphy, of San Francisco, owner.

Hoboken Mines (Quartz).—See our XIIth Report, p. 158. They comprise the *Collector*, *Hoboken*, and *Treasurer* claims, and lie in Potter Ridge District. L. Krohn, of Gold Gulch, owner.

Homestake Mine (Quartz).—See our XIIth Report, p. 158. It is near Hildreth. The vein, 2′ to 6′ wide, dips 45° N.W. in granite. Developed by two inclines, 115′ and 160′ deep, and drifts therefrom. Wise & Brennan, of Hildreth, owners.

Hughes Mine (Quartz).—It is at Hildreth, and is partially developed. Idle. R. Williams, of Hildreth, owner.

Indian Peak Mine (Quartz).—See Mammoth.

Jeff Davis Mine (Quartz).—It is a prospect at Grub Gulch. C. Knox, of Oakland, owner.

Josephine Mine (Quartz).—See our VIIIth and Xth Reports, pp. 213 and 202. It is in Grub Gulch, at 2,000′ elevation. Exploited by several inclines. From the 550′ shaft, the deepest, eight levels were driven. Formerly supplied with steam hoist, Cornish pump, and 20-stamp mill. Idle. Risdon Iron Works, of San Francisco, owner.

Keefe Mine (Quartz).—It is a prospect on Deadwood Gulch, near Gold Gulch. T. Keefe, of Gold Gulch, owner.

Keno Mine (Quartz).—See our XIIth Report, p. 159. It is in Potter Ridge District. M. A. Kipperdam, of Gold Gulch, owner.

Lady Tad Mine (Quartz).—It is on Greaser Gulch, 2½ miles N.E. of Coarse Gold, and has a narrow vein of rich quartz, in mica schist. The quartz from this claim and the Greaser Gulch claim, which joins it, is crushed in arrastras. J. S. Lingo, of Gold Gulch, owner.

Last Chance Mine (Placer).—It is at the "old adobe crossing" of the San Joaquin River. J. F. Hutchinson, of North Fork, owner.

Last Chance Mine (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 211, 201, and 159. It is 3 miles W. of Gold Gulch, and has two tunnels, each 700′ long. The 3′ vein courses N.E. and S.W., and dips 35° S.E., in slate. Supplied with a 10-stamp steam-power mill, 2 miles from the mine. Idle. D. R. McKenzie et al., of O'Neals, owners.

Last Chance Mine (Quartz).—It is 5 miles W. of Hildreth, and is a prospect. C. Williams, of Hildreth, owner.

Laura May Mine (Quartz).—It is a prospect, 2 miles E. of Gold Gulch, and has a vein 12″ to 18″ wide. D. McLellan et al., of Gold Gulch, owners.

Lawsuit Mine (Quartz).—It is 2 miles E. of Hildreth, adjoining the Morrow Mine. P. Bazinet, of Hildreth, owner.

Lillie Mine (Quartz).—See our XIIth Report, p. 159. It is 2 miles E. of O'Neals, and is worked to 100′ in depth, but is now idle. McDonald Bros., of Sonora, Tuolumne County, owners.

Lingo Mine (Quartz).—It is on Swede Gulch, 2 miles N.E. of Gold Gulch, and has three tunnels, 80′, 130′, and 200′ long, respectively. In this mine is found a zone of foliated, quartzose mica schist bearing gold. The zone is 35′ wide, all of which is claimed to carry gold. J. S. Lingo, of Gold Gulch, owner.

Little Willie Mine (Quartz).—It is in Fine Gold Gulch, and is a prospect. G. P. Gunter, of Pollasky, owner.

Little Wonder Mine (Quartz).—See our XIIth Report, p. 159. It is in Fine Gold Gulch. D. McLellan, of Gold Gulch, owner.

Lottie K. Mine (Quartz).—See our XIIth Report, p. 159. It is 5 miles S. of Hildreth. J. A. Harris et al., of Pollasky, owners.

Lucky Bill Mine (Quartz).—It is on the east side of Potter Ridge, 6 miles S.E. of Grub Gulch. It has a tunnel 230′ long, with an upraise of 100′ to the surface. Considerable stoping has been done. A water-power arrastra is being built ½ mile from the mine. The quartz is granular, glassy, and bunchy, resembling the Fresno Enterprise, a mile to the northward, and, like the latter, pays well. The country rock is mica schist, which also frequently carries gold in paying quantities in this vein-like zone. John Morrison et al., of Grub Gulch, owners.

Lucky Boy Mine (Quartz).—See Eighty-six.

Lucky Dog Mine (Quartz).—A prospect in Greaser Gulch, 2 miles N.E. of Gold Gulch. T. Kipperdam, of Gold Gulch, owner.

Lucky Star Mine (Quartz).—It is near Hildreth. R. Stayton et al., of O'Neals, owners.

Mabel Mine (Quartz).—It is in Hildreth District. W. F. Roddick, of Fresno, owner.

Madera Mine (Quartz).—See our XIIth Report, p. 160. It is in Fresno Mining District, and has a 90′ incline on a 4′ vein. A. Cadoza et al., of O'Neals, owners.

Mammoth Mine (Quartz).—See our XIIth Report, p. 160. It is at Grub Gulch, and includes the *Indian Peak* claim, which is undeveloped. Since our last Report the shaft has been sunk to a depth of 360′, and levels run at the 100′, 200′, and 300′ stations, together with numerous cross-cuts; besides, considerable stoping has deen done. The cross-cuts on the 200′ and 300′ levels developed an unexpected feature of the geology of the region. In the foot-wall is a large mass, size undetermined, of crystalline limestone or marble, which does not appear upon the surface at any point in the vicinity; it is probably a portion of the regular formation, and not a deposit. The hanging-wall, at the greatest depth reached, is still mica schist, as above. At a depth of 300′ a floor or slip was encountered, though the amount of displacement was very small. Nevertheless, it seems to have had a direct influence upon the deposition of gold in the vein-like zone, which is a silicious schist. For a distance of 20′ or more above the floor the quartz was very rich, gold being seen frequently, but below it the gold disappeared almost entirely. During 1894 a 10-stamp mill was built on this mine, and a hoisting works erected over the shaft. This machinery was operated by electricity, generated 1¼ miles distant on Fresno River. The entire property has been shut down, with little promise of resumption. W. D. Pearson, of London, owner; Arthur Thomas, of Grub Gulch, agent.

Manzanita Mine (Quartz).—It is near Hildreth. Idle. R. P. Brownell, of Hildreth, owner.

Marguerite Mine (Quartz).—See our XIIth Report, p. 160. It is near Fine Gold. Charles Baker et al., of O'Neals, owners.

Mayflower Mine (Quartz).—It is 6 miles N.E. of Hildreth, near Fine Gold.

Miller's Mine (Quartz).—It is 6 miles S.W. of Hildreth, and has only superficial development. H. L. Miller et al., of Pollasky, owners.

Minneapolis Mine (Quartz).—See Savannah.

Mint Mine (Quartz).—It is a prospect in Swede Gulch, 2 miles N.E. of Gold Gulch. C. Peterson et al., of Gold Gulch, owners.

Monitor Mine (Quartz).—It is in Cabin Gulch, 1½ miles N. of Gold Gulch, and has only superficial workings. C. Peterson et al., of Gold Gulch, owners.

Morning Star Mine (Quartz).—See our XIIth Report, p. 161. It is 1½ miles E. of Gold Gulch. J. Hitchcock, of Alameda, owner.

Morrow (Bazinet) Mine (Quartz).—See our Xth and XIIth Reports, pp. 195 and 154. It is 2 miles E. of Hildreth, at 1,650′ elevation. The vein courses E. and W. and dips 30° to 40° N., and varies from a thin seam to 18″ in width. There are several inclines, the deepest being 270′ in depth, besides drifts, stopes, etc. The quartz is crushed in arrastras. P. Bazinet, of Hildreth, owner.

Mountain Lily Mine (Quartz).—It is a prospect, 3 miles N. of Gold Gulch. D. McLellan, of Gold Gulch, owner.

Mountain View Mine (Quartz).—See our Xth Report, p. 198. It is 5 miles S. of Gold Gulch. Idle. J. Donohue, of Fresno, owner.

Mud Springs (Wilson) Mine (Quartz).—It is at Hildreth, and has a 300′ shaft on an 18″ vein. Idle. S. H. Williams, of O'Neals, owner.

Muhly Mine (Placer).—It is on the North Fork of San Joaquin River. T. Muhly, of North Fork, owner.

Nellie Gray Mine (Quartz).—See our XIIth Report, p. 161. It is 2 miles N. of Hildreth, and is a small, rich vein. J. H. Oester, of O'Neals, owner.

Neversweat Mine (Placer).—It is in Fine Gold Gulch. J. A. Harris, of Pollasky, owner.

New Citizen Mine (Quartz).—See our XIIth Report, p. 161. It is on Deadwood Gulch, 1½ miles N.E. of Gold Gulch. C. A. Lee et al., of Gold Gulch, owners.

North Lillie Mine (Quartz).—It is 2 miles E. of O'Neals, and is an extension of the Lillie. F. Wetmore, of O'Neals, owner.

Old Joe Mine (Quartz).—See Savannah.

Overlooked Mine (Quartz).—It is 1 mile S.E. of Hildreth. J. H. Morris, of Hildreth, owner.

Owl Mine (Quartz).—See our XIIth Report, p. 161. It is on Jackass Mountain. G. D. Hitchcock, of Madera, owner.

Paymaster Mine (Quartz).—See our XIIth Report, p. 161. It is 4 miles S.E. of Gold Gulch. It has a 900′ tunnel and a 10-stamp mill. Idle. Waterloo Gold Mining Co., of San Francisco, owner.

Paterson Mine (Quartz).—It adjoins the Mud Springs Mine, near Hildreth. J. Keating, of O'Neals, owner.

Petersen Mine (Quartz).—See Savannah.

Pine Grove Mine (Quartz).—See our XIIth Report, p. 162. It is 15 miles N.E. of Hildreth. James Lawson, of North Fork, owner.

Pine Island Mine (Quartz).—It is a prospect ½ mile below the mouth of Coarse Gold Gulch, on the north side of Fresno River. W. Downey et al., of Raymond, owners.

Plain View Mine (Quartz).—It is a prospect near Gold Gulch. F. Mellow et al., of Gold Gulch, owners.

Pray Mine (Quartz).—See our XIIth Report, p. 162. It is near Fine Gold Gulch. D. L. Pray, of O'Neals, owner.

Prospect Mine (Quartz).—It is a prospect in Swede Gulch. C. Petersen et al., of Gold Gulch, owners.

Prospect Mine (Placer).—It is at Hildreth. C. Petersen et al., of Gold Gulch, owners.

Providence Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 206 and 162. It is 1½ miles N.E. of Gold Gulch. The 2′ vein courses N.W. and S.E., and dips 28° N.E., in granite. Opened by a 200′ incline and 500′ tunnel, partly caved. D. McLellan, of Gold Gulch, owner.

Quartz Mountain (*Min d'Or de Quartz Mountain*) *Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 210 and 162. The vein, from a seam to 10′ in thickness, occurs in granite, which near the fissure has a schistose structure. The upper portion of the vein lies upon or very near the surface, the granite of the hanging-wall having been removed by erosion. The dip varies from 10° to 40° E., but is usually about 25°. The main incline is 250′ deep. There is an old 60-stamp steam-power mill and hoist on the property. Idle. J. H. Perry, of Gold Gulch, agent.

Reba Mine (Quartz).—It is a prospect at Grub Gulch, on an east and west vein crossing the Arkansas Traveler vein. Charles Knox, of Oakland, owner.

Round Tree Mine (Quartz).—It is a prospect 3 miles S.E. of Hildreth. E. D. Topping, of Hildreth, owner.

Riverside and Starlight Mines (Quartz).—See our XIIth Report, p. 162. These mines are ½ mile S.E. of Grub Gulch, and are operated as a single mine. Since our last Report this property has been developed by a 340′ incline on the vein, and levels run at the 100′, 200′, and 300′ stations. These developments expose large quantities of gold-bearing quartz, the vein ranging from 4′ to 15′ wide. Charles M. Ward et al., of Grub Gulch, owners.

Runaway Mine (Quartz).—It is 2 miles E. of Hildreth, and has a 100′ incline. The quartz is worked in arrastras. R. Williams et al., of Hildreth, owners.

San Joaquin Mine (Quartz).—See our XIIth Report, p. 163. It is 5 miles S. of Hildreth. J. A. Harris et al., of Pollasky, owners.

San Joaquin Mine (Quartz).—It is 5 miles S.E. of Hildreth, and has several hundred feet of tunnels and upraises. George Sym, of Hildreth, owner.

Savannah Mines (Quartz).—See our XIIth Report, p. 163. This property is situated from 1 to 2 miles S.E. of Grub Gulch, and comprises the following five claims, viz.: the *Minneapolis*, with a 150′ tunnel on the vein; *Savannah*, developed by two shafts, 150′ and 230′ deep respectively, and two cross-cut tunnels; *Wide Awake*, with superficial development; *Old Joe*, developed by a 250′ shaft, and a 60′ air shaft and a 100′ connecting cross-cut tunnel between them (see our XIIth Report, p. 158);

and the *Petersen*, which has only superficial development. Since our last Report the 10-stamp mill has been completed, and a water-power hoist erected over the main shaft of the Savannah. A 2,300′ tramway has also been built from the Old Joe Mine to the foot of hill in French Gulch, where ore-bins have been constructed, from which the quartz will be hauled by wagon to the mill. Louis H. Sharp, of San Francisco, owner; Charles W. Haskell, of Grub Gulch, superintendent.

S. E. Canady Mine (Quartz).—It is 6 miles S.E. of Hildreth, and has only superficial development. S. E. Canady et al., of Pollasky, owners.

Seneca Mine (Placer).—It is 5 miles E. of Hildreth. S. May, of Pollasky, owner.

Sequin Mine (Quartz).—See our XIIth Report, p. 163. A prospect. D. McLellan et al., of Gold Gulch, owners.

Smultz Mine (Quartz).—See our XIIth Report, p. 163. It is near Hildreth, and has an 80′ tunnel and a 40′ incline. Smultz Bros., of Fresno, owners.

Snow Flake Mine (Quartz).—See our XIIth Report, p. 163. It has a 375′ tunnel. Smith Norris, of Fresno, owner.

Solferino Mine (Quartz).—It is 4½ miles S.W. of Grub Gulch, on a small vein in granite. It has an 80′ incline. Louis Daello, of Stockton, owner.

Standard Mine (Quartz).—See our XIIth Report, p. 163. It is 2 miles N. of Hildreth, and has a 35′ tunnel and a 135′ shaft. G. W. Keller et al., of O'Neals, owners.

Standard No. 2 Mine (Quartz).—It is 2 miles N.E. of Gold Gulch, and has a 60′ tunnel and several surface cuts. D. McLellan, of Gold Gulch, owner.

Starbuck Mine (Quartz).—See our XIIth Report, p. 164. It is near Fine Gold, and has a 40′ tunnel. Mark Anderson, of O'Neals, owner.

Starlight Mine (Quartz).—See Riverside and Starlight.

Stemwinder Mine (Quartz).—See our XIIth Report, p. 164. It is on Jackass Mountain. Smith Norris, of Fresno, owner.

Sunol Mine (Quartz).—See our XIIth Report, p. 164. It is 2½ miles N.W. of Gold Gulch. There is a 100′ shaft on a 2′ ledge pitching 45° E. J. Krohn, of Gold Gulch, owner.

Surprise (*Old Jackass Brown*) *Mine* (Quartz).—See our XIIth Report, p. 164. It is on Jackass Mountain. There is a 40′ shaft and a 90′ tunnel, on a small vein dipping 60° N.E. B. Norris, of North Fork, owner.

Swede Gulch Mine (Quartz).—It is 1½ miles N.E. of Gold Gulch, and has superficial development on a vein 2′ to 5′ wide. Theodore Strombeck, of Gold Gulch, owner.

Texas Flat Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 212 and 164. It is 1½ miles N.W. of Gold Gulch. It was formerly well developed by shafts and tunnels The 800′ tunnel has just been cleaned out and retimbered. J. B. Haggin et al., of New York, owners.

Tiger Mine (Quartz).—See our XIIth Report, p. 164. Idle. W. A. Poole, of Grub Gulch, owner.

Triangle Mine (Placer).—It is near North Fork. J. D. Jones, owner.

Unmitigated Mine (Quartz).—See our XIIth Report, p. 164. A 50′ shaft on an 8″ to 14″ vein. J. Morrison et al., of Gold Gulch, owners.

Viana Mine (Quartz).—It is near Hildreth, and has a 400′ tunnel. Idle. W. R. Hampton, of Pollasky, owner.

Victoria Mine (Quartz).—It is 6 miles N.E. of Grub Gulch, on Crooks Mountain. It is patented, and, after years of idleness, is to be reopened. Not now accessible. John Haley, of Ahwahnee, owner.

Vienna Mine (Quartz).—It is a prospect in Potter Ridge District. F. Dutchman, of Gold Gulch, owner.

Volcano No. 1 Mine (Quartz).—It is at Hildreth. The vein, 12″ to 15″ wide, lies nearly flat, cutting hornblende schist. It is worked by lessees, who crush the quartz in arrastras. It has several inclines, from 100′ to 130′ long. Charles O'Neals, of O'Neals, owner.

Washington Mine (Quartz).—See our XIIth Report, p. 164. A prospect, 2 miles N.E. of Gold Gulch. D. McLellan, of Gold Gulch, owner.

Wide-awake Mine (Quartz).—See Savannah.

Williams Mine (Quartz).—It is 2 miles E. of Hildreth, near the Morrow Mine. The vein is small, and the quartz is worked in arrastras. George and Reuben Williams, of Hildreth, owners.

Willow Creek Mine (Quartz).—It is 2½ miles S. of O'Neals. The vein can be traced on the surface for a distance of 1,500′, and is from 6″ to 4′ or more in width, carrying gold and auriferous sulphides. A shaft was recently sunk on the vein and a steam arrastra built, but, no provision being made to control the water in the mine, sinking was soon abandoned, and shortly afterward the work closed. The prospect is deserving of a more thorough trial, under competent management. Charles O'Neals, of O'Neals, owner.

Zebra Mine (Quartz).—See our VIIIth and Xth Reports, pp. 210 and 199. Zebra Mining Co., of Gold Gulch, owner.

MILLS IN MADERA COUNTY.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of Each, in Lbs.	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
					No.	Character.	No.	Capacity.		
Abby		10	850							
Fresno Enterprise		20	700	(Machinery going to decay.)						
Hanover		5	700	10						
Hawkeye		5	800							
Mammoth		10	850	30						
Quartz Mountain		60	850		6	Frue				
Savannah		10	850	30	4	McGlew				

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN MADERA COUNTY.

Name of Mill or Mine.	Power.	Number	Character.	Diameter	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
						No.	Character.	No.	Capacity.		
Cliff			Arrastra								
Contention			Arrastra								
Crystal Spring			Huntington		25						
Eliza Jane			Arrastra								
Empire			Arrastra		1½						
Europa	Horse		Arrastra		1						
Gambetta and Arkansas Traveler			Huntington	3½″	8	2	Triumph				
Hildreth			Huntington								
Lady Tad			Arrastra		½						
Lawsuit			Arrastra								
Lucky Bill	Water		Arrastra		1½						
Morrow			Arrastra								
Pine Grove			Arrastra								
Williams			Arrastra								
Willow Creek	Steam		Arrastra		3						

Mariposa County.

As prophesied in our last Report, this county has experienced a decided impetus in the mining industry. The reopening of the mines on the Cook Estate, near Coulterville, has not only given employment to a large number of men and infused new life into the community, but it has stimulated activities all over the county. The machinery placed upon the mines at Coulterville is of the finest and most expensive description. On the " East Lode " there is active prospecting, and attention is being attracted to these mines, many of which are high grade, and would pay handsomely if provided with better facilities. On the Mariposa Estate, whose boundaries are clearly outlined on the "Mother Lode Map," recently issued by the Bureau, considerable prospecting has been done, under the supervision of the agent, and several promising veins have been discovered. But the mines on this last property are still idle.

Adelaide Mine (Quartz).—See Crown Lead.

Alabama Mine (Quartz).—See Whitlock.

Anderson Mine (Quartz).—See Crown Lead.

Banderita Mine (Quartz).—See our XIIth Report, p. 167. It is 10 miles E. of Coulterville. Idle. C. L. Mast, of Coulterville, agent.

Barley Field Mine (Quartz).—It is a pocket mine, in granite, 4½ miles N.E. of Mariposa. Joseph Laundrum, of Mariposa, owner.

Barrett Mine (Quartz).—It is 7 miles N.E. of Mariposa, near Bear Creek, and is a new prospect. J. W. Stetson et al., owners.

Barrett Mine (Quartz).—It is 6 miles N.W. of Bear Valley, in Hunters Valley. It is a prospect. Joseph Barrett, of Hornitos, owner.

Black Bart Mine (Quartz).—See our XIIth Report, p. 168. It is a pocket mine, 11 miles E. of Coulterville. S. B. Sample, of Coulterville, owner.

Black Hill Mine (Quartz).—It is 1 mile N.W. of Coulterville. A 600′ tunnel has been driven on it. Clark & McLaymont, of Coulterville, owners.

Bondurant (*Hathway*) *Mine* (Quartz).—See our VIIIth Report, p. 347. It is on the " East Lode," 11 miles N.E. of Coulterville, at 2,860′ elevation. The 30″ vein courses E. and W., and dips 38° N. Idle. Bondurant Gold Mining Co., of St. Louis, Mo., owner; C. F. Bruner, of Coulterville, superintendent.

Buena Vista Mine (Quartz).—It is a prospect, 3 miles S.E. of Coulterville. Two men are employed. Angelo Gabarina, of Coulterville, owner.

Bull Pup and Bull Dog Mines (Quartz).—They are near the Whitlock, 6 miles N. of Mariposa. J. Helm & Son, of Mariposa, owners.

Cabinet Mine (Quartz).—It is 2½ miles S.W. of Coulterville, near Horseshoe Bend. There are two veins in this claim, which intersect at an angle of 45°. One of them strikes N.W., and carries gold; the other strikes E., and contains both gold and cinnabar. The latter vein, 8″ to 3′ wide, has formed in a dike cutting the diabase. C. L. Mast, of Coulterville, owner.

Campodonica Mine (Quartz).—It is 1 mile E. of Hornitos. Idle. Campodonica Mining Co., of Hornitos, owner.

Champion Mine (Quartz).—Fully described in our Xth Report, p. 302. It is in granite, 4½ miles N.E. of Mariposa. Idle. James Ridgeway, of Mariposa, owner.

Cherokee Mine (Quartz).—It is 9 miles E. of Coulterville, and has developments on two veins, which are 30′ apart. A tunnel has been driven 600′ on the larger vein. J. Shimer, of Coulterville, owner.

Comet Mine (Quartz).—It is 12 miles E. of Mariposa, near Schneider's mill. There is a 60′ shaft on the vein, and two tunnels, each over 300′ long. The vein is from a few inches to 4′ in width. Idle. Dan Heaton, of Jerseydale, owner.

Compromise (*Marble Spring*) *Mine* (Quartz).—It is 13 miles E. of Coulterville, and is being worked in a small way after a long idleness. M. Hilliard, of Coulterville, owner.

Congo Mine (Quartz).—See our XIIth Report, p. 168. It is 3 miles E. of Coulterville. A cross-cut tunnel, 250′ long, intersects a shaft at the vein. The vein is large, and, besides gold, carries iron and copper sulphurets. J. Mentzer, of Coulterville, owner.

Cranberry Mine (Quartz).—See our VIIIth Report, p. 348. It is 25 miles E. of Mariposa, on the Middle Fork of Merced River, at 2,550′ elevation. The vein courses N.W. and S.E., and dips 40° N. A 700′ tunnel has been driven on the vein; 600′ from the mouth, it connects with a 200′ shaft. The pay-shoot is 4′ wide. A. H. Ward, of Alameda, owner.

Crown Lead Mines (Quartz).—This property is S.W. of Coulterville, and comprises a large group of claims extending 16,000′ along the lead. The southern end of the property is the *Crown Peak* claim, near Split Rock Ferry, from which the lead extends in a northerly direction to within 2½ miles of Coulterville. The *Crown Peak* (patented) is 1,166′ long, and developed by a 45′ shaft on an 8′ vein. The *Robert Emmet* (patented) is 1,500′ long, superficial development. The *Crown Lead* (patented) is 5,584′ long, and has a 50′ shaft and a 75′ tunnel. The *Crown Lead No. 2* is 1,500′ long, and has a 30′ shaft. The *Occidental* is 1,500′ long, with superficial development. The *Anderson* (patented) is 2,000′ long (see our Xth Report, p. 38), and the vein is 4′ to 12′ wide. It has three tunnels, 170′, 175′, and 350′ long, respectively. This claim lies to the eastward of the main line of claims, on a branch vein. The *Adelaide* (patented) is 2,750′ long (see our Xth Report, p. 38), and the vein is 8′ to 10′ wide. There are tunnels and a 90′ shaft. The *Midas* (patented) is 2,000′ long, and the 45′ shaft exposes a 6′ vein. Most of the development on this property was done about twenty-five years ago, when an extensive system of roads was also built. These mines are on the west branch of the "Gold Belt," which leaves the main fissure at the *Pine Tree* and *Josephine* mines and unites with it again near *Piñon Blanco*, 3 miles N.W. of Coulterville. All the veins are similar geologically, being banded, branching, and building up by frequent overlapping or "splicing" of sheets of quartz. Dike rocks are commonly present, sometimes on one wall, and as often on both. The fissures cut alike through slates and diabase. Idle. Robert E. McSherry and the McCrellish Estate, owners; W. B. McSherry, of Coulterville, superintendent.

Crown Peak Mine (Quartz).—See Crown Lead.

Dahlia Mine (Quartz).—See Merced Gold Mining Co.

Dan Cook Mine (Quartz).—See Merced Gold Mining Co.

Dina Mines (Quartz).—These are 7 miles N.E. of Mariposa, on Volcanic Hill, and comprise four claims. The gold-bearing zone is found in amphibolite schist, and contains 2% to 3% auriferous pyrite. Sheets of quartz are also found in the schistose diabase. Ten men are employed. W. H. Wright, of Mariposa, owner.

Doss (Brooks) Mine (Quartz).—It is 2 miles S. of Hornitos. A 110′ shaft has been sunk on the vein, which near the bottom is heavily mineralized. The sulphurets are chiefly iron pyrite, galena, blende, and chalcopyrite. The mine has a steam hoist, and power drills are used in the shaft. Five men are employed. Estate of E. F. Brooks, of Hornitos, owner.

Duncan Mine (Quartz).—It is 1 mile S. of Hornitos. Idle. William and George Turner, of Hornitos, owners.

Elizabeth Mine (Quartz).—See Mariposa Mining and Commercial Co.

Evans Mine (Quartz).—See our XIIth Report, p. 169. See Mariposa Mining and Commercial Co.

Farmers' Hope Mine (Quartz).—See our Xth Report, p. 309. It is 6½ miles N. of Mariposa, near the Whitlock Mine. Ellingham & Gove, of Mariposa, owners.

Ferguson Mine (Quartz).—It is 23 miles N.E. of Mariposa. It has a large amount of development, but only assessment work has been done for several years past. William Sharwood, of Soulsbyville, Tuolumne County, owner.

Filiciana Mine (Quartz).—It is 10 miles N.E. of Mariposa, and is worked in a desultory manner. J. C. Campbell, of San Francisco, owner.

Flyaway Group (Quartz).—It is 7 miles S.E. of Coulterville, near the head of Flyaway Gulch, and comprises eight claims, none of which have much development. A 5-stamp mill has been used to prospect the several claims. W. M. Darling, of Oakland, agent.

Frances Mine (Quartz).—It is about 7 miles S.W. of Mariposa, on Mariposa Creek. There are two veins in the claim, 60′ apart. They are from 4′ to 8′ wide, and carry free gold and auriferous sulphurets. J. E. Towles, of Oakland, agent.

Franklin Mine (Quartz).—See Washington.

Georgiana Mine (Quartz).—It is on the Mariposa Estate, 2 miles N.E. of Bear Valley. The vein stands perpendicularly and strikes E., and is from 8″ to 18″ wide. The quartz is pure white, crystallized in part, and carries a small percentage of iron sulphurets, but is rich in gold. Two tunnels and some surface cuts have recently been made on the vein. Mariposa Mining and Commercial Co., of San Francisco, owner.

Green Gulch Mine (Quartz).—It is ½ mile W. of Princeton, and on the "Mariposa Grant."

Hasloe Mine (Quartz).—It is on Gentry's Gulch, near the North Fork of Merced River. Idle. John Morgan, of San Francisco, owner.

Hayseed Mine (Quartz).—See our Xth Report, p. 308. It is 6½ miles N. of Mariposa, near the Whitlock. The 14″ vein courses N. 60° E., and dips 40° E., between slate and diabase. J. Helm & Son, of Mariposa, owners.

Heiser and Peregoy Mine (Quartz).—See our Xth Report, p. 308. It is 6½ miles N. of Mariposa, near the Whitlock, and has a 60′ shaft. The 8′ vein courses N. and S., and dips slightly E., in slate. Chas. H. Schlagerter et al., of Mariposa, owners.

Hite Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 344 and 170. It is 23 miles E. of Mariposa, at 2,080′ elevation. The 8′ vein courses E. and W., and dips 75° N., in slate. Since our last Report the dam has been rebuilt, a new flume constructed, and the surface plant rehabilitated. The mine has been pumped out, the old workings cleaned and in places retimbered, and mining operations resumed. The 20-stamp mill has been rebuilt, and 15 stamps are now running; the quartz being taken from the old levels, mostly below the adit level, but as yet no attempt has been made to sink the winze deeper or to prospect below the old levels. Thirty-eight men are employed. John R. Hite, of San Francisco, owner.

Horseshoe Mine (Quartz).—It is 10 miles E. of Coulterville, and has a 600′ tunnel on the vein. C. L. Mast, of Coulterville, owner.

Horseshoe Mine (Quartz).—It is in Hunters Valley, 3 miles W. of Bear Valley. It is equipped with a steam hoist and 5-stamp mill. The incline shaft is 105′ deep. Thirteen men are employed. The Horseshoe Mill, Power, and Mining Co., of Merced, owner.

Jenny Lind Mine (Quartz).—See Washington.

Josephine Mine (Quartz).—See our Xth and XIIth Reports, pp. 35 and 309, and 173–174. Since our last Report, old workings have been reopened, and show the existence of another large ore-shoot, 1,000′ N.W. of that previously described. Mariposa Mining and Commercial Co., of San Francisco, owner.

Juniper Mine (Quartz).—See our XIIth Report, p. 171. It is 1½ miles W. of Bear Valley. Idle.

Lacy (*Talc*) *Mine* (Quartz).—See our Xth and XIIth Reports, pp. 304 and 171. It is 7 miles N.E. of Mariposa, near Colorado. One man is employed. George Lacy, of Mariposa, owner.

La Grippe Mine (Quartz).—It is 8 miles E. of Coulterville, and has two shafts, 80′ and 50′ deep. Idle. P. P. Mast, owner; C. L. Mast, of Coulterville, superintendent.

Lewis Mine (Quartz).—It is on the Mariposa Estate, ½ mile N.W. of Princeton. It is a new discovery, and is presumed to be a northerly extension of the Princeton vein. It has been opened to a depth of 60′ by several shafts, which are connected by drifts. The vein is small, but rich. Three men are employed. Mariposa Mining and Commercial Co., of San Francisco, owner.

Lookout Mine (Quartz).—It is 2½ miles S.W. of Coulterville. A tunnel has been driven 60′ on a 3′ vein. P. P. Mast, owner; C. L. Mast, of Coulterville, agent.

Louisa Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 346 and 171. A vertical shaft is being sunk in the hanging-wall, which had reached a depth of 400′. Fifty men are employed. Merced Gold Mining Co., of Boston, Mass., owner; J. R. Gilbert, of Coulterville, superintendent.

Louisiana Mine (Quartz).—It is 9 miles E. of Coulterville, and has three shafts, 180,′ 100′, and 75′ deep, respectively; also several hundred feet of cross-cut tunnels, drifts, etc. The vein occurs in black slate, with a dike on the hanging-wall side. Idle. The hoists and mill were burned several years ago. J. T. Gove, of San Francisco, owner.

Ludwig Mine (Quartz).—It is ½ mile N.W. of Princeton, on the Mariposa Estate. It lies several hundred feet west of and nearly parallel to the Princeton vein. It has a large amount of superficial development, most of which was done many years ago. A tunnel has been driven on the vein recently. Mariposa Mining and Commercial Co., of San Francisco, owner.

Mahone Mine (Quartz).—See our VIIIth Report, p. 347. It is 2 miles N.W. of Coulterville, at 1,700′ elevation. Merced Gold Mining Co., of Boston, Mass., owner.

Malvina Mine (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 347, 39, and 172. It is 1½ miles W. of Coulterville, on the West Lode. Since our last Report, this and the *Potosi*, adjoining it on the N.W., have been reopened. The old Potosi tunnel has been cleared of debris and a new vertical shaft sunk in the hanging-wall slates of the Malvina, which was said to be 500′ deep, and sinking was being continued. Fifty men are employed. Merced Gold Mining Co., of Boston, owner; J. R. Gilbert, of Coulterville, superintendent.

Malvina No. 2 Mine (Quartz).—It is 1¼ miles W. of Coulterville, joining the Malvina on the south. It has an incline 100′ deep. Merced Gold Mining Co., of Boston, Mass., owner.

Manzanita Mine (Quartz).—It is 13 miles E. of Coulterville, near Marble Spring. It is worked in a small way, the quartz being crushed in an arrastra. Two men are employed. M. Hilliard, of Coulterville, owner.

Mariposa Mine (Quartz).—It is in the town of Mariposa. Mariposa Mining and Commercial Co., of San Francisco, owner.

Mariposa Mining and Commercial Co. is owner of the "Mariposa Estate" or "Grant"—a tract of 70 square miles. See "Mother Lode Map," recently issued by the Bureau, and our VIIIth, Xth, and XIIth Reports, pp. 343, 33–37, 309, and 172. The most important mines on the "Grant" are the *Pine Tree*, *Josephine*, *Princeton*, *Mariposa*, *Mount Ophir*, *Lewis*, *Georgiana*, *Ludwig*, and *Texas*. Besides these, there is a large number of other claims, in various stages of development. During the past two years considerable prospecting has been done on the "Grant," under the direction of John D. Ludwig. Ores from the various claims were mined, and hauled by wagon to a 5-stamp mill on Missouri Gulch and crushed. Five men are employed.

Margaret Mine (Quartz).—It is at Coulterville, and is undeveloped. Merced Gold Mining Co., of Boston, Mass., owner.

Martin and Walling Mine (Quartz).—It is 8 miles E. of Coulterville. Idle. C. L. Mast, of Coulterville, agent.

Mary Harrison Mine (Quartz).—See our VIIIth and Xth Reports, pp. 346 and 41. It is 2 miles S.E. of Coulterville, at 1,700′ elevation. The vein, averaging 12′ in width, courses N.W. and S.E., and dips 50° easterly. The old workings, 600′ deep, have been reopened, and a new vertical shaft is being sunk north of the old incline. Twenty-five men are employed. Merced Gold Mining Co., of Boston, Mass., owner.

Merced Gold Mining Company, of Boston.—Thos. Couch, manager; J. R. Gilbert, of Coulterville, superintendent. Since our last Report, this company has purchased the large mining territory near Coulterville for years known as the "Cook Estate," and comprising about 20,000 acres. Within this area are thirteen claims, a portion of which are on the "Mother Lode," and others on the "West Lode." See our VIIIth, Xth, and XIIth Reports, pp. 346, 38, and 168. On the Mother Lode the claims south of Coulterville are the *Margaret*, *Louisa* (2 claims, 3,000′), *Ventura*, *Mary Harrison*, and *Dahlia*. On the "West Lode" the claims are the *Malvina*, *Malvina No. 2*, *Potosi*, *Dan Cook*, and *Mahone*. The *Midas* and *Sheridan* claims are on other veins. On the Louisa, Mary Harrison, Malvina, and Potosi, the old workings have been cleaned out and retimbered, and three new vertical shafts are being sunk. Concerning the underground developments nothing can be authoritatively said, as admission to the mines and all information were positively refused. Of the surface improvements, it may be said there are none better on any mining property in California, and everything is being done on an elaborate scale. A 40-stamp mill is being built in the cañon of Black Creek, a short distance from the mouth of the Potosi tunnel, which will be run by water taken from the creek about ½ mile above. The superintendent stated that it was the intention to construct lines of railway from the several mines to the mill, where the ores would be crushed and tested from time to time, as the work of development proceeds.

Mexican (*El Carmen*) *Mine* (Quartz).—It is 25 miles E. of Mariposa. Two tunnels, 240′ and 380′ long, respectively, have been run on the vein. A shaft 120′ deep intersects the upper tunnel 100′ from the surface. The ore is high grade and has been ground in arrastras. Idle. A. H. Ward, of Alameda, owner.

Mexican Mine (Quartz).—It is 1 mile S.W. of Bear Valley. See Mariposa Commercial Co.

Mexicans' Mine (Quartz).—It is 1½ miles W. of Bear Valley, adjoining the Yellowstone. Worked by Mexicans, who crush the quartz in arrastras. Two men are at work.

Midas Mine (Quartz).—It is 2 miles S.W. of Coulterville. See Merced Mining Co.

Midas Mine (Quartz).—It is 2½ miles S.W. of Coulterville. See Crown Lead.

Mount Gains Mine (Quartz).—It is 5 miles N.E. of Hornitos, and has a 300′ shaft. Idle. Joseph Spagnoli, of Hornitos, owner.

Mount Ophir Mine (Quartz).—See Mariposa Mining and Commercial Co.

Nevada Mine (Quartz).—See our XIIth Report, p. 173. It is a pocket mine, 2 miles W. of Bear Valley. Two men are employed. Judge Hall, of Bear Valley, owner.

No. 9 Mine (Quartz).—See our XIIth Report, p. 173. It is 2½ miles W. of Hornitos. The vein is 4′ to 10′ wide, and is developed by shafts, 210′ and 440′ deep, respectively. It has a steam hoist and a 30-stamp mill. Idle. M. L. Rodgers, of Hornitos, owner.

Occidental Mine (Quartz).—It is 3½ miles S.W. of Coulterville. See Crown Lead.

Pine Tree Mine (Quartz).—See our Xth and XIIth Reports, pp. 35–309 and 173. It is 1¾ miles N. of Bear Valley, on the Mariposa Estate. Mariposa Mining and Commercial Co., of San Francisco, owner.

Piñon Blanco Mine (Quartz).—See our Xth Report, p. 43. It is 3 miles N.W. of Coulterville, and consists of three claims, viz.: *Old Judge* (1,500′), *Piñon Blanco* (5,850′), and *North Piñon* (550′). The Old Judge has two tunnels, 25′ and 100′ long, respectively, besides several surface openings. In this mine is a shoot of white quartz, through which is disseminated, in small crystals, gray copper and iron sulphurets. It is said to be a good grade of milling rock. This shoot lies near the contact of gabbro with a large ankerite mass, in which mariposite is quite prominent. The Piñon Blanco claim has over 1,000′ of tunnels, drifts, and shafts. These developments show the ankerite mass to exceed 300′ in width. A massive vein of quartz, with a ribbon-like structure, is found on the hanging-wall side, and some of this is rich in gold. The North Piñon Blanco claim is on the same hill as the last mentioned, and is similar in every way to it. A 200′ tunnel has been driven on this claim. Four men are employed. A. H. Ward, of Alameda, owner.

Potosi Mine (Quartz).—See our Xth Report, p. 39. See Merced Gold Mining Co.

Princeton Mine (Quartz).—It is at Princeton. See Mariposa Mining and Commercial Co.

Quail Mine (Quartz).—It is 10 miles E. of Coulterville, and is usually worked during the season when water is abundant. F. Bruschi, of Coulterville, owner.

Quartz Mountain Mine (Quartz).—See our XIIth Report, p. 175. It is 2 miles S. of Hornitos. Idle. W. L. Rodgers, of Hornitos, owner.

Red Cloud Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 345 and 175. It is 10 miles E. of Coulterville. Idle. Red Cloud Mining Co., of Boston, owner.

Red Hill Mine (Quartz).—See our Xth and XIIth Reports, pp. 41 and 175. It is 6½ miles S.E. of Coulterville. The vein occurs at contact of diabase and serpentine, and contains iron and copper sulphurets and free gold. Mrs. G. Cammissiona, of Coulterville, owner.

Regan Mine (Quartz).—It is 6 miles N. of Mariposa, near the Whitlock, and has an 80′ shaft. H. Austin et al., of Fresno, owner.

Reliance Reduction Works.—This enterprise is 2 miles S. of Hornitos, near the Quartz Mountain Mine, and was built to treat the custom concentrates from the mines of the district. The plant consists of a single reverberatory furnace and the necessary leaching and precipitating vats. Idle. Reliance Reduction Co., owner; W. H. Ham, of Hornitos, superintendent.

Rising Sun Mine (Quartz).—It is 1 mile W. of Bear Valley. It has been worked to a depth of 60′, but too much water stopped further sinking, there being no machinery on the mine. J. Dalcich et al., of Bear Valley, owners.

River View Mine (Quartz).—It is 6 miles N.W. of Hornitos, near Merced River. A 70′ shaft has been sunk on a vein 8′ to 10′ wide, which carries 3% sulphurets. There is also a 30′ tunnel. Henry Nelson, of Merced Falls, owner.

Robert Emmet Mine (Quartz).—See Crown Lead.

Rollins Mine (Quartz).—It is on Sweetwater Creek, 8 miles E. of Mariposa, and is an old mine being reopened. Two men are engaged in driving a tunnel. Revelle Bros., of Jerseydale, owners.

Rutherford Mine (Quartz).—It is 25 miles E. of Mariposa. Some years ago a tunnel was driven 340′ on the vein, which was then stoped to the surface, the quartz being ground in arrastras. It now requires machinery. There are only trails to the mine, the nearest wagon-road being that to the Hite Mine. A. H. Ward, of Alameda, owner.

Santa Clara Mine (Quartz).—It is 7 miles N.E. of Mariposa, adjoining the Santa Rosa on the north. It has a 60′ incline and a 100′ tunnel. Two men are employed. Stetson & Hart, of Mariposa, owners.

Santa Rosa Mine (Quartz).—It is 7 miles N.E. of Mariposa, on the west side of Bear Creek, and has come into prominence since our last Report. It was worked some time by C. D. Lane et al., with W. Garrard as superintendent, but was unsatisfactory, and closed down. It is reported that part or all the purchase price was refunded. The mine is equipped with a 10-stamp steam-power mill and concentrators.

Schroeder Mines (Quartz).—They are on the Schroeder ranch, 9 miles N.E. of Mariposa. They consist of several pocket veins that are worked in a small way. John Schroeder, of Mariposa, owner.

Sebastopol Mine (Quartz).—See our Xth Report p. 305. It is 4 miles S.E. of Mariposa, at 2,850′ elevation. The vein courses N. and S. and dips vertically. Dismantled and abandoned. — Hart, of Mariposa, owner.

Sheridan Mine (Quartz).—See Merced Gold Mining Co.

Sherlock Mine (Quartz).—See our Xth Report, p. 306. It is 5½ miles N.E. of Mariposa. Idle.

Sirocco Mine (Quartz).—See Yellowstone.

Spencer Mine (Quartz).—It is 6½ miles N. of Mariposa. The vein is in diabase, and has a 100′ shaft, now caved. Near the north end of the claim a tunnel has been run in 480′ on the fissure, cutting two pay-shoots, 45′ and 55′ long, respectively. The face of the tunnel is 200′ below the surface. The vein averages 3′ wide. A. H. Ward, of Alameda, owner.

Star Mine (Quartz).—It is 11 miles E. of Coulterville, near North Fork of the Merced, and has a tunnel 250′ long. C. L. Mast, of Coulterville, agent.

Stevenson Group (Quartz).—It is on the north side of Merced River, at Redbanks, about midway between Benton Mills and Split Rock Ferry, and comprises five claims. Several cross-cut tunnels have been run at various points, and prospecting work is now in progress. Eight men are employed. A. Wartenweiler, of San Francisco, owner.

St. Paul Mine (Quartz).—It is a prospect, 3½ miles S.E. of Coulterville. Angelo Gabarino, of Coulterville, owner.

Teets Mine (Quartz).—It is 6 miles N. of Mariposa, and has a shaft 150′ deep. Two men are employed. Jacob Teets, of Mariposa, owner.

Texas Gulch Mine (Quartz).—It is on Texas Gulch, 1 mile S.W. of Princeton. Two 60′ shafts have recently been sunk on a 12″ vein of rich quartz. Mariposa Mining and Commercial Co., of San Francisco, owner.

Thorn Mine (Quartz).—It is 2 miles S. of Hornitos, near the Quartz Mountain Mine. Idle. Mrs. Hardwick, of Hornitos, owner.

Triple Alliance Mine (Quartz).—It is 2½ miles N.W. of Bear Valley, and is a new prospect in the diabase of Bear Mountain. Three men are employed. Robert Hutchinson et al., of Bear Valley, owners.

Triumph Mine (Quartz).—It is 6 miles N. of Mariposa, near the Whitlock. The shaft is 150′ deep. Two men are employed. J. Helm, of Mariposa, owner.

Tyro Mine (Quartz).—See our Xth and XIIth Reports, pp. 39 and 176. It is 1¼ miles S.W. of Coulterville. The main shaft is 700′ deep, with air connections to the old shaft. An 8″ Cornish pump has recently been added to the plant. The steam hoist and mill are both under one roof. Wood is delivered at the mine by pack train. Thirty men are employod. San Francisco Mining Co., owner; J. McLaughlin, of Coulterville, superintendent.

Vanderbilt Mine (Quartz).—See our XIIth Report, p. 176. It is on Buckingham Mountain, 8 miles E. of Mariposa, and lies in the mica schists, which extend S.E. to Potter Ridge District, Madera County. Since our last Report, considerable work has been done at this mine, and a 10-stamp mill built on Snow Creek, ½ mile from the mine. The quartz is hauled in large cars from the mine to the mill. At present a number of men are engaged in overhauling the tramway and mill, preparatory to resuming work. Sunset Mining Co., owner; George Beebe, of Darrah, superintendent.

Ventura Mine (Quartz).—See Merced Mining Co.

Virginia (*Coe*) *Mine* (Quartz).—See our Xth Report, p. 41. It is 4 miles S. of Coulterville. The property has for years been involved in litigation, which is understood now to have been settled, with a prospect of a resumption of operations. O'Toole & Arnold, of San Diego, owners.

Washington Mines (Quartz).—See our XIIth Report, p. 176. They consist of the *Washington*, *Franklin*, and *Jenny Lind*, and are 2½ miles N.E. of Hornitos. The Washington was formerly a large producer, and worked to a depth of 1,500′. M. L. Rodgers, of Hornitos, owner.

Westminster Mine (Quartz).—It is 5 miles N.W. of Hornitos, and is a new prospect, having a 25′ shaft on a vein 3′ to 4′ wide. Henry Nelson, of Merced Falls, owner.

Whitlock and Alabama Mines (Quartz).—See our XIIth Report, p. 176. They are 6 miles N. of Mariposa, and are located on parallel veins. The principal development is on the Whitlock vein. A cross-cut tunnel has been driven 600′ to the vein, along which a drift extends several hundred feet. There are also several surface openings and shorter cross-cut tunnels, and two shafts. The main shaft is now 480′ deep, and still being sunk. A fire occurred in the mine in the summer of 1895. The shaft timbers were completely burned out, and the fire, communicating with the hoisting works on the surface, destroyed them also; subsequently, heavy caves of wall-rock occurred in the shaft. This necessitated sinking the new shaft, and involved a great amount of dead work in clearing the mine of debris. During the temporary stoppage of active mining operations the 20-stamp mill was kept running on a large pile of quartz previously mined, and hoisted through the old shaft. A shaft is also being sunk on the Alabama vein. It has a good, substantial hoisting plant and a Cornish pump. This shaft is at present the principal source of water-supply for the mill, as water is scarce in the neighborhood. A succession of dams has been built in the gulch below the mill, where the tailings are settled and the water pumped back. Sixty-three men are employed. Sierra Buttes Gold Mining Co. (Ltd.), of London, owner; William Johns, of 320 Sansome Street, San Francisco, general manager; A. G. Briggs, of Mariposa, superintendent.

Wilson Mines (Quartz).—They are 1 mile E. of Hornitos, on the Wilson ranch, a tract of 480 acres, in which are several quartz veins. The quartz is crushed in a 2-stamp mill having discharge on three sides, the capacity being 6 tons per day. Power is furnished by an oil-engine. The mill has one Triumph concentrator. Six men are employed. Rose McCann, of Hornitos, owner.

Wilson & Pedburg Mine (Quartz).—It is 8 miles E. of Coulterville, and has a 30′ shaft and a cross-cut tunnel to the vein. Wilson & Pedburg, of Coulterville, owners.

Yellowstone Sirocco Mine (Quartz).—See our XIIth Report, p. 175. It is 1½ miles W. of Bear Valley, just outside of the "Grant." It has a 400′ shaft on a vein in diabase. Equipped with a steam hoist. The gold is found in quartz, calcite, and amphibolite schist. Fourteen men are employed. Yellowstone Mining Co., of San Francisco, owner; C. H. Burt, of Bear Valley, superintendent.

MILLS IN MARIPOSA COUNTY.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of Each, in Lbs.	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
					No.	Character.	No.	Capacity.		
Bondurant		10	850							
Compromise		10	850							
Farmers' Hope		5	750							
Flyaway		5	750							
Hite	Water	40	750	50	2	(20 stamps	work	ing.)		
Horseshoe		5	750	12	2					
No. Nine		30	750							
Potosi		40	850							
Quail		10	750							
Quartz Mountain		10	850	25						
Red Cloud		10	800							
Santa Rosa		10	850	25	2	Johnson				
Tyro		10	850	25	3	Frue				
Vanderbilt		10	850	25						
Virginia		10	(In poor	condition.)						
Whitlock		20	850	50	8	Frue				
Wilson		2	900	6	2	Triumph				
Yellowstone		5	750	15						

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN MARIPOSA COUNTY.

Name of Mill or Mine.	Power.	Number	Character.	Diameter	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
						No.	Character.	No.	Capacity.		
Cranberry	Water	2	Arrastras		1½						
Manzanita			Arrastras								
Mexicans'			Arrastras								
Rutherford			Arrastras								

Mendocino County.

The mineral wealth of this county, although considerable, has never received the attention it deserves. The coal beds on Eel River and at Round Valley are probably the largest deposits in the State. Copper is found in Eden Valley and near Ukiah; bituminous rock occurs in large deposits near Point Arena, and chromic iron is known to exist in several localities. No mining, but only some prospecting on copper properties, is being prosecuted in this county. The agricultural interests center in the large valley of Russian River; grapes, fruit, and hops being the principal products. Lumbering is carried on extensively along the coast, on several small streams heading in the redwood belt. The dairy interests are also large.

Bay Edgar Mine (Quartz).—See our XIIth Report, p. 176. It is on Red Mountain, 12 miles S.E. of Ukiah, at 2,000′ altitude. A tunnel has been driven 25′ to cross-cut the vein, and a drift started east. The vein shows 20″ of quartz, standing vertically. The cost of transporting the ore to water has retarded development. Idle. C. H. Stout, of Ukiah, owner.

Van Allen Mine (Quartz).—See our XIIth Report, p. 177. It is situated in the hills, 6 miles W. of Ukiah, at 1,000′ altitude. The tunnel has been driven 35′, through a tough glaucophane schist, to tap the vein lower down the hill, and it is supposed that 15′ more will cut the ledge. William Van Allen, of Ukiah, owner.

Mono County.

Adrian Mine (Quartz).—See New Enterprise.

Bay Queen Mine (Quartz).—See our XIIth Report, p. 177. It is 3 miles S.W. of Lundy. Finley Cameron, of Bodie, owner.

Beautiful Bells Mine (Quartz).—See Sunshine.

Bishop Mine (Quartz).—See New Enterprise.

Blackwood Mine (Quartz).—See New Enterprise.

Bodie Mine (Quartz).—Situated in Bodie. No new developments, but it is being exploited on the 200′ and 300′ levels by drifts and cross-cuts. John W. Kelly, of Bodie, superintendent.

Bodie Tunnel and Bechtel Mines (Quartz).—They are 1 mile N. of the Standard Mine, and have a series of veins from 6″ to 3′ wide. These mines are tapped by a 5′x 7′ tunnel, 1,100′ long, at the mouth of which is a 15-stamp steam-power mill, with 40 H.P. engine and boiler. A small cyanide plant, of 10 to 15 tons daily capacity, has been erected in the mill. The mines have been leased to tributers, who store the ore in the chutes until sufficient has been accumulated to run the mill a short time. The tailings are impounded, and will be cyanided. Cain & McCone, of Bodie, owners.

Booker Flat Tailings.—The tailings from the Noonday and Red Cloud mills, previous to 1878, accumulated to a depth of 1′ to 5′ over a 100-acre tract, which has recently been located as placer ground. In places the tailings have become so hard that a plow has been used to loosen them. They are worked by the South End Cyanide Plant. J. S. Cain et al., of Bodie, owners.

Bryant Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 371 and 177. It is 3 miles S. of Lundy. No recent developments. R. T. Pierce, of Lundy, owner.

Bulwer Mine (Quartz).—See our VIIIth Report, pp. 389 and 396–98. Situated at Bodie. Ten men are employed in stoping, above the tunnel level. J. W. Kelly, of Bodie, superintendent.

Cain's Cyanide Plant.—It handles the tailings from the Bodie Tunnel mill. Capacity, 20 tons daily.

Charlestown Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 385 and 177. It is situated on the side of the mountain, at 8,700′ elevation, overlooking Mono Lake. Developed by tunnels and cross-cuts. Idle. J. P. Hammond, of Mono Lake, owner.

Columbia Mine (Quartz).—See our XIIth Report, p. 178. It is 12 miles W. of Bodie. Idle. T. Albright, of Lundy, owner.

Consolidated Mine (Quartz).—See New Enterprise.

Contention (*Addenda*) *Mine* (Quartz).—See our VIIIth Report, p. 392. This is a recent relocation, and lies S. of the Standard Mine. A small steam hoist has been erected on the old 400′ shaft, and it is now being cleaned out and retimbered. It is reported that a large amount of low-grade ore remains untouched in the mine, and it is the intention of the owners to treat it by the cyanide process. Cain, Kelly & McCone, of Bodie, owners.

Cowboy Mine (Quartz).—It is in Castle Peak District, 12 miles S. of Bridgeport, at 7,500′ elevation. On the bold croppings a 60′ incline has been sunk. R. A. Cameron, of Bridgeport, owner.

Cyanide Process.—There are six cyanide plants in and around Bodie, in which accumulated tailings of the different stamp mills are treated. They are the *Cain*, *New Standard*, *South End*, *Standard*, *Tarr & Tyack*, and *University* plants. The *modus operandi* is similar in all. See our Bulletin No. 5, by Dr. A. Scheidel.

Dark Horse Mine (Quartz).—See our XIIth Report, p. 178. It is 10 miles N.E. of Bishop Creek. No recent developments. J. H. Bulpit, of Bishop Creek, owner.

Defiance Mine (Quartz).—See our VIIIth Report, pp. 383–385. It is situated near Bodie, and until the fall of 1895 has been idle for a number of years. The old 800′ shaft is now being retimbered.

Dogtown Diggings (Placer).—Situated 9 miles S. of Bridgeport, at 7,000′ elevation, and comprises 140 acres of gravel, 15′ to 25′ deep. It is worked by Chinese tributers, with free water under a light pressure. C. Anderson, of Bridgeport, owner.

Duarte Mine (Quartz).—See our XIIth Report, p. 178. It is 5 miles N.E. of Laws. Idle. Charles Duarte, of Laws, owner.

Dunderberg Mine (Quartz).—See our XIIth Report, p. 178. It is 12 miles S. of Bridgeport. Exploited by a 700′ cross-cut tunnel and 350′ of drifts. No recent developments. A. F. Bryant et al., of Bridgeport, owners.

Erie Mines (Quartz).—This group comprises ten claims, situated on the northern slope of Prospect Mountain, 1½ miles N. of Lundy. The Erie tunnel is 2,600′ lower than the croppings of the May Lundy, on which vein these claims are located; it is now in some 700′. R. T. Pierce, of Lundy, superintendent.

Eva Mine (Quartz).—It is situated on the northwestern slope of Bodie Bluff, and is prospected by a 1,200′ cross-cut tunnel. Four veins, 12″

to 36″ wide, and low-grade, have been intersected. Assessment work only. W. A. Loose, of Bodie, owner.

Excelsior Mine (Quartz).—See Mabel.

Faulk Mine (Quartz).—See our XIIth Report, p. 178. It adjoins the Mammoth Mine, in Lake Mining District. Idle. D. C. Albright, of Bishop Creek, owner.

Goleta (*Detroit*) *Mines* (Quartz).—See our XIIth Report, p. 178. This group comprises the *Goleta*, *Montecito*, and *Sterling* mines, and they lie on the eastern slope of the Sierra, about 6 miles N.E. of Lundy. They are exploited by numerous cross-cut tunnels, shafts, winzes, and drifts Tunnel No. 1 had progressed 1,190′ when work ceased on account of poor air. A seven miner's inch flow of water was encountered in the face, and was considered a favorable indication for an ore-body. Tunnel No. 2 has been driven 470′ on the vein, and four cross-cuts, 118′, 46′, 72′, and 66′, run therefrom, all in ore. The croppings are very noticeable, standing 60′ and more high, and continuing 7,000′ or more in length. A tunnel, called the Combination, has been started, and a 200-acre mill-site taken up close by. A 2¾-mile ditch is projected from Mill Creek, which will give a 300′ head at the mill-site with 1,700′ of pipe. The altitude at the mill-site is 7,500′; at the Combination tunnel, 8,150′, and at Tunnel No. 2, 8,500′. Gold, silver, and copper are contained in the ores. A new 40-stamp water-power mill was built in September, 1896. Goleta Mining Co., of No. 330 Pine Street, San Francisco, owner; D. E. Jones, of Lundy, superintendent.

Gorilla Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 370 and 179. It is situated on the northern slope of Mount Scowdan. No recent developments. Gorilla M. & M. Co., of San Francisco, owner.

Gray Eagle Mine (Quartz).—See our XIIth Report, p. 179. It lies 1 mile S.W. of Lundy. No recent developments. F. Pierce, of Lundy, owner.

Harrison Mine (Quartz).—See our XIIth Report, p. 179. It is 1 mile S.W. of Lundy, at 9,200′ elevation. No new developments. A. L. Butterfield, of Lundy, owner.

Headlight Mine (Quartz).—See Monte Cristo.

Hinda Rose Mine (Quartz).—See Sunshine.

Hirsch Mine (Quartz).—See Reward.

Homer M. & M. Co.'s Mines (Quartz).—See our Xth and XIIth Reports, pp. 342 and 179. They lie on the western slope of Mount Scowdan. No recent developments. Company's office, No. 330 Pine Street, San Francisco.

Homestake Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 360 and 180. It is in Silverado Cañon, and the ore carries about equal amounts of gold and silver. Idle. Andrew Sayers, of Bridgeport, owner.

Jackson and Lakeview Co.'s Mines (Quartz).—See our VIIIth and XIIth Reports, pp. 371 and 180. They are 5 miles S. of Lundy, on the eastern slope of Mount Scowdan, and comprise the *Jackson*, *Lakeview*, *May Lundy*, and *North May Lundy* claims. They course N. and S., and dip 30° to 74° W. The lode is exploited by numerous tunnels, drifts, shafts, and winzes. Tunnels Nos. 1, 2, and 3 are on the lode, and are 112′, 720′, and 1,140′ long, respectively. Lakeview cross-cut tunnel is 418′ and the Jackson cross-cut tunnel 220′ long. The breasts of these tunnels are about 700′ vertically below the croppings, and several hundred feet of drifts have been driven. The ore is transported from the

Lakeview tunnel 2,560′ by an overhead $1\frac{1}{16}$″ (Hallidie) rope tram, over a very rugged and steep mountain side, to the 10-stamp water-power mill. The ropeway supports are 14′ to 34′ high and 100′ to 200′ apart. The automatic dumping buckets are 125′ apart, and carry 120 lbs. each. Thirty tons of ore are delivered in nine hours. Hooks on the rope are used to convey supplies to the mine. The stamps of the mill weigh 1,000 lbs. each and are dropped 98 times per minute. The mill is supplied with Challenge ore-feeders, a Gates crusher, and Frue vanners. Power is supplied by water from Lake Oneida, through 760′ of pipe, under 140′ head, acting upon a 4′ Pelton wheel. A 25 H.P. engine and boiler are held in reserve as auxiliary power. A chlorination plant, with a capacity of 2 tons per day, was completed in 1895, and consists of a Bruckner furnace, 6′x 12′, revolving once in 3½ minutes; one steel, 5½′x 7½′, chlorination barrel, lined with lead, and revolving 6 times per minute; two settling-tanks, 8′ in diameter and 32″ deep; and three 5′x 7′ precipitating-vats. The altitude at the mill is 9,660′; at Lakeview tunnel, 11,230′, and at the croppings, 12,500′. There are 47 men employed, as follows: In the mine, 36; mill, 4; chlorination plant, 2; tramway, 2; roustabouts, 2; assay office, 1. R. T. Pierce, of Lundy, superintendent.

Johnnie and Rose of the West Mines (Quartz).—See our XIIth Report, p. 180. They are 16 miles S. of Benton. Idle. J. King, of Benton, owner.

Last Chance Mine (Quartz).—See our XIIth Report, p. 180. This is on the same vein as the May Lundy, on the summit of Mount Scowdan. No recent developments. W. F. McKenzie, of Lundy, owner.

Lora Mine (Quartz).—See our XIIth Report, p. 180. It is 10 miles S. of Benton. Idle.

Lucky Morton Mine (Quartz).—See our XIIth Report, p. 180. It lies 3 miles S. of Lundy, and adjoins the May Lundy. No recent developments. Assessment work only. Frank Todd, of Calais, Me., owner; R. T. Pierce, of Lundy, agent.

Mabel Mines (Quartz).—See our XIIth Report, p. 181. They lie on the western slope of the White Mountain range, 11 miles N. of Bishop Creek. This group comprises five claims: *Excelsior*, etc. Idle. Owen Neylon, of Bishop Creek, owner.

Mammoth Mine (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 373, 341, and 181. Idle. Bank of California, San Francisco, owner.

Mineral Chief Co.'s Mines (Quartz).—See our XIIth Report, p. 181. The property consists of four claims, lying on the eastern base of the Sweetwater range, in the Patterson Mining District. Idle. T. C. Sharp, of Clifton, owner.

Mono Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 396 and 181. Situated on the northern slope of Mount Scowdan. Idle. R. G. Montrose, of Lundy, owner.

Mono Lake Mining Co.'s Mine (Hydraulic).—It is 4 miles E. of Lundy, and consists of 400 acres of patented ground. The depth of gravel is unknown, and a 111′ shaft in the center of the claim failed to reach bedrock. The gravel is said to "prospect" from the surface down. Mill Creek, which heads at Mono Lake, flows through the claim. The owner, in 1895, was moving the hydraulic pipe from Mono Diggings, and preparing to hydraulic under a 300′ head. R. N. Graves, of No. 312 Pine Street, San Francisco, owner.

Mono Queen Mine (Quartz).—See Native Wonder.

Monte Cristo and Headlight Mines (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 360–375, 341, and 181. Situated in Lake Mining District. Idle. Hon. P. Reddy, of San Francisco, owner.

Montecito Mine (Quartz).—See Goleta.

Native Wonder and Mono Queen Mines (Quartz).—See our XIIth Report, p. 181. The Native Wonder is on the north side and the Mono Queen on the south side of a steep cañon on the west side of Mono Lake. No recent developments. E. C. Mattly, of Mono Lake, owner.

Neal Mine (Quartz).—See our XIIth Report, p. 181. It is 6 miles S.W. of Benton, at 8,000′ elevation. Idle. Hon. P. Reddy, of San Francisco, owner.

New Enterprise Mines (Quartz).—See our VIIIth and XIIth Reports, pp. 396 and 182. This group of mines comprises the *Adrian*, *Bishop*, *Blackrock*, *Consolidated*, *New Enterprise*, and *Oro* claims. They are old properties, relocated. Idle. Messrs. Cain, McCone & Kelly, of Bodie, owners.

New Standard Cyanide Plant.—It is now (May, 1896) under construction some distance below Bodie, where a large body of tailings has been deposited. Capacity, 100 tons daily.

Noonday and Red Cloud Mines (Quartz).—See our VIIIth and XIIth Reports, pp. 396 and 182. These mines, ½ mile S. of Bodie, are being worked by tributers, on the 250′ level of the Red Cloud and 400′ level of the Noonday. About every three months the ore is reduced in the Bodie Tunnel Co.'s mill, 1 mile north of and below the mines. A. P. Cameron, A. Graham, and E. L. Reese, of Bodie, lessees.

Ontario Syndicate's Mines (Quartz).—See our XIIth Report, p. 182. Its ten claims are situated on Mount Scowdan. Idle. Ontario Syndicate, of Lundy, owner.

Oro Mine (Quartz).—See New Enterprise.

Parrott Mines (Quartz).—See our XIIth Report, p. 182. On Mount Scowdan. Idle. Mr. Parrott, of Lundy, owner.

Rattler Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 362 and 182. It lies on the north side of Ferris Cañon, in the Sweetwater Mountains. No recent developments. Faulk, Kirkpatrick & Brown, of Sweetwater, Esmeralda County, Nev., owners.

Rattlesnake Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 363 and 182. It is 12 miles W. of Bodie. Idle. M. J. Cody, of Lundy, owner.

Red Cloud Mine (Quartz).—See Noonday.

Sacramento Mine (Quartz).—See our XIIth Report, p. 183. It is in Piute Mining District, 16 miles N.E. from Bishop, at about 6,000′ elevation. The main tunnel has been extended to 300′ and the lower one to 60′ in length. In the end of the main tunnel a 40′ raise is made, and the quartz is being stoped. The vein is about 3′ thick, and is filled with a jaspery quartz stained with iron. A double arrastra driven by an 18″ Dodd wheel, under 273′ pressure, belongs to the property. Water is conveyed through 2,800′ of V flume with 10″ sides, and 650′ of 4″ pipe. The wheel makes 850, and the arrastra shaft 8, revolutions per minute. J. H. Bulpitt et al., of Bishop, owners.

Scientific Press Mine (Quartz).—See Sunshine.

South End Cyanide Plant.—It is on the Western slope of Queen Bee Hill, 1½ miles S. of Bodie, and has a capacity of 150 tons in twenty-four hours. There are 6 leaching vats, 20′ in diameter and 7′ deep; 4 other same size vats for water, stock-solution, and storage; and 2 zinc or precipitating boxes, 24″x 24″x 15′ long. The tailings from the Noonday mill are dumped directly from the wagons into the vats, a substantial roadway passing over them. The stock-solution is raised by a centrifugal pump operated by steam. J. S. Cain et al., owners; R. Recknagel, manager and chemist.

Southern Belle Mine (Quartz).—See our XIIth Report, p. 183. It is in the White Mountains, 5 miles N.E. of Laws. E. Duenwig, of Laws, owner.

Spartan Mine (Quartz).—See our XIIth Report, p. 183. It adjoins the Sterling, 6 miles N.E. of Lundy. Idle. M. R. Burns, of Lundy, owner.

Standard Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 385 and 183. It is on the hill just east of Bodie. No new developments since our last Report, all work being confined to and above the 500′ level. A station is being cut in the west wall of the 800′ level to receive a 30 H.P. 500-volt D. C. motor, geared to a Dow triple pump, which will raise the water to the Bulwer tunnel, 300′ above, where there is a 50 H.P. electric hoist. Since the old hoist was destroyed by fire, all ore and waste are raised to this level and trammed through the tunnel. The property is supplied with a 20-stamp mill and a cyanide plant. The mine, mill, etc., are lighted by incandescent lamps. All the works are run by electricity—see special article, "Electric Power Transmission Plants and the Use of Electricity in Mining Operations," in our XIIth Report, pp. 413–454. A 15 H.P. motor is employed to draw the cars of tailings from the settling-basins to the cyanide works. In consequence of the freezing of the water in Green Creek, which drives the dynamo, 12 miles distant from Bodie, the company has commenced the construction of two storage reservoirs, to insure a constant source of power. The cyanide plant is of 100 tons daily capacity, and the tailings are hauled by wagon to a bin above the plant, and thence by cars to the upper floor of the plant, which is level with the upper edge of the vats. The vats are 7′ deep, 20′ in diameter, and have a capacity of 80 tons each. They are filled with dry tailings, and, when full, a weak solution of cyanide of potassium is applied until saturated. They are allowed to stand from 3 to 8 hours, when a stronger solution is applied for about 12 hours. The liquor is then drawn off, and clean wash-water used from 12 to 20 hours, or until all cyanide is leached out. The tailings are then sluiced out, the filters' bottoms cleaned, and the tanks refilled with a new charge of tailings. There are two sets of zinc boxes; the one for the wash-water, which is wasted after passing through the zinc, and the other for the strong liquor. The latter set comprises three boxes, 16″x 16″x 18′, and uses about 20 lbs. of zinc per day. The resulting gold slimes are purified from the adhering zinc in a vat, painted with asphaltum, by sulphuric acid; when settled it is collected, dried, and melted. The liquor, after passing the zinc, is pumped back to the top, and used as weak solutions, or fortified with cyanide to standard solution and pumped to the vats by a 5 H.P. motor. Standard Consolidated Mining Co., of San Francisco, owner; R. G. Brown, of Bodie, superintendent.

Sterling (*Detroit Copper*) *Mine* (Quartz).—See Goleta.

Summit (*Kate Rodgers*) *Mine* (Quartz).—See our VIIIth Report, p. 396. It resumed active operations in 1895, after being idle fifteen years.

The 400′ shaft is being retimbered. J. W. Kelly, of Bodie, superintendent.

Sunshine Mines (Quartz).—This group of mines, comprising the *Beautiful Bells*, *Hinda Rose*, and *Scientific Press*, are situated on the eastern slope of the Bodie Bluff. On the Sunshine is a 100′ shaft. Assessment work only. W. A. R. Loose, of Bodie, owner.

Syndicate Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 387 and 184. It is 1 mile E. of Bodie. No recent developments. The 10-stamp steam-power mill runs about half time. The ore-bodies left by the original company are being extracted by tributers J. F. Parr and S. Figue, of Bodie.

Tarr & Tyack Cyanide Plant.—It treats the tailings of the Syndicate Milling and Mining Co., and has a capacity of 20 tons daily.

University Mine (Quartz).—It lies on the northwestern slope of Queen Bee Hill, ½ mile S. of Bodie, and adjoins the Noonday. The vein courses N.W. and dips slightly E. The 400′ shaft, sunk in 1879, is being retimbered to the 300′ level. On the 100′ level the vein is 2′ wide, and low-grade. On the 300′ level the 22′ cross-cut shows the vein to be 4′ wide. The ore is very "soft," crumbling so much by handling that it has to be screened (75% being sand and 25% coarse stuff) before being sent to the company's 7-stamp steam-power mill, situated 4 miles N. of Bodie. A 20-ton cyanide plant is being erected in the mill building, and the 75% of fine ore will be cyanided direct. A 20 H.P. engine furnishes power. W. A. R. Loose and R. A. Leale, of Bodie, owners.

Ward Mine (Quartz).—It lies in Castle Peak District, 12 miles S. of Bridgeport, at about 9,000′ elevation. At the bottom of the 4′x 6′ vertical 140′ shaft, ore is being stoped from the 2′ to 4′ vein, which is encased in porphyry. No sulphurets. A 5-stamp water-power mill belongs to the property, and runs about half time. J. L. McLeoud, of Bridgeport, owner.

Wild Rose Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 378 and 184. It is situated 8 miles S.E. of Benton. No recent developments. McNamara & Dowd, of Benton, owners.

Wolverine Mine (Quartz).—See our XIIth Report, p. 184. It lies on the northern slope of Mount Scowdan, at 9,700′ elevation. No recent developments. Lake Lundy M. & M. Co., of San Francisco, owner; R. G. Montrose, of Lundy, superintendent.

MILLS IN MONO COUNTY.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of of Each, in Lbs.	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity, in Tons.	Canvas Table, Size.
					No.	Character.	No.	Capacity.		
Bodie	Steam	10	750	30						
Bodie Tunnel and Bechtel	Steam	15	850	30						
Dunderberg		20	700	40						
Goleta	Water	40	1,000		(10	Pans)				
Jackson and Lakeview	S. & W.	10	1,000	30		Frue	1	2		
J. S. Cain									20	
Mammoth	Water	10	900	30						
Miners	Steam	7	900	21						
New Standard									100	
Sheehan	Steam	5	600	10						
South End									150	
Standard	Elect.	20	850	50					100	
Syndicate	Steam	10	850	20						
Tarr & Tyack									20	
Ward	Water	5	800	6						
University	Steam	7							20	

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN MONO COUNTY.

Name of Mill or Mine.	Power.	Number	Character.	Diameter	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
						No.	Character.	No.	Capacity.		
Monte Cristo and Headlight	Steam	2	Huntington		48						
Sacramento	Water		Double Arrastra								

Monterey County.

The only gold mines in this county are in Los Burros Mining District, a rough, mountainous region, 45 miles S.W. from Kings City by road and trail, and 3 miles from the ocean. A number of claims were located a few years ago, and some development work done. See our XIth and XIIth Reports, pp. 259 and 184. They have all been idle since our last Report, except the

Last Chance (*Cruikshank*) *Mine* (Quartz).—It is in the central part of the district, at about 2,500′ altitude. The Monterey Mining Co. had a bond on it during the spring of 1895, and ran the 5′ Huntington mill for a time, working tailings, etc. The ore occurs in pockets, and is said to run about 8% sulphurets. N. D. Cruikshank, of Mansfield, superintendent.

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN MONTEREY COUNTY.

Name of Mill or Mine.	Number	Character.	Diameter	Capacity per 24 Hrs., in Tons.	Concentrators.	
					No.	Character.
Cruikshank	1	Huntington	5′	14	1	Frue.

Napa County.

The larger part of this county is contained in Napa Valley, one of the most fertile agricultural districts in the Coast Range. Wine, grapes, prunes, etc., are the principal products. Gold and silver occur near St. Helena Mountain, and the latter has been mined with success. Iron ore, magnesite, fire-clay, and building-stone occur in the county, and have been and are still being mined or quarried. In the northern part several large quicksilver mines are situated, and they furnish employment to several hundred men.

Brown & Smith Cons. Mine (Quartz).—It is situated in Kings Cañon, 2½ miles N. of Calistoga, at 775′ elevation. It is developed by a 60′ incline shaft on the vein and a 200′ cross-cut tunnel. The country rock is a soft, gray porphyry. Idle. Dr. W. D. Smith et al., of Calistoga, owner.

Griffith Mine (Quartz).—This is a new discovery on Atlas Peak, 17 miles N.E. of Napa. An open cut, 10′ deep, discloses a vein of porphyry and quartz 3½′ thick. The quartz shows pyrite. A shaft is now (1895) being sunk on the vein. Ed Griffith et al., of Napa, owners.

Nevada County.

Allison Ranch Consolidated Mining Co.'s Mine (Quartz).—See our XIth Report, p. 268. It is on Wolf Creek, 3 miles S. of Grass Valley, at 2,000′ elevation, and comprises 60 acres, including the Allison Ranch and Stanton Mines. After a long period of inactivity this mine is to be reopened. The vein, about 2′ wide, trends N. and S., and dips 33° W., in a grano-diorite formation. There were two inclines on the old mine; the north one was 700′ deep, with seven levels, and the south one 300′ deep, connecting with the north shaft on the 300′ level. In all, there are about 1,000′ of drifts. A combination hoist building and a separate boiler-house are being erected. Water-power and a compressor plant will be erected, using 200 miner's inches, under 235′ pressure. Fifteen men are grading. An incorporated company, of San Francisco, owner; J. E. Walch, Nevada Block, San Francisco, secretary.

Alpine (St. Louis and Wild West) Mine (Quartz).—It is 2 miles E. of Nevada City, at 2,725′ elevation, and comprises two claims. The two parallel veins, about 1½′ wide, strike N.E. and S.W., and dip 70° W., in granite. The quartz carries a small percentage of iron and lead sulphurets. The developments comprise a 700′ tunnel, a cross-cut to the S.W., 143′ long, and an upraise connecting with the surface, 125′ above. Two men are employed. — Morgan et al., of Nevada City, owners.

Annie Mine (Quartz).—See Glenn.

Arctic Mine (Quartz).—It is on Cañon Creek, 7 miles N.E. from Washington, at 4,750′ elevation. The vein strikes N. and S., and dips 60° E., in a granite formation, showing 2½′ of quartz. There are two short tunnels, each 20′ in length, giving, when extended, 150′ of backs on the vein. Two men are prospecting. O. Helgesen et al., of Washington, owners.

Atlantic Mine (Quartz).—It is 1½ miles S.E. of Eureka, at 5,450′ elevation. The vein strikes N. 12° W., and dips 45° E., showing 2½′ of quartz between granite walls. There are two cross-cut tunnels; No. 1 is 200′ long; No. 2, 200′ farther east and 40′ below, is 130′ long. One man is at work. G. O. Rooker, of Eureka, owner.

Badger Hill Mine (Hydraulic and Quartz).—See our XIIth Report, p. 185. It is 1 mile S.E. of Cherokee. Badger Hill Gold Mining Co., of North San Juan, owner.

Baltic Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 451 and 185. It is 5 miles S. of Graniteville, in God's Country Ravine. J. McBean et al., of Washington, owners.

Beckman Mine (Quartz and Hydraulic).—See Mayflower.

Belle-Fontaine Mine (Quartz).—See our XIIth Report, p. 185. It is on Deer Creek, 3 miles E. of Nevada City, and comprises 1,200′ by 350′. Since our previous Report, the lower tunnel has been extended 200′, showing an ore-shoot 210′ long and averaging 2′ wide; a 260′ upraise has also been made on the slope of the vein. Ten men have been employed, though temporarily idle. W. J. Smith et al., of Nevada City, owners.

Berriman Consolidated Gold and Silver Mining and Milling Co.'s Mine (Quartz).—It is on Wolf Creek, in Grass Valley, at 2,575′ elevation, and comprises the *Berriman* and the *Dromedary* claims. The Dromedary is the larger vein, and has a history as a rich producer; it trends slightly W. of N., and is cut through by the Berriman vein, which then turns and follows the course of the Dromedary on the under side, with but a few feet of wall rock intervening. Both veins pitch west, in a grano-diorite formation, the Berriman somewhat the steeper, and are from 4″ to 2′ or 3′ in width. On the Dromedary is a 5½′x 10′ incline, 300′ deep, from which a drift extends 400′ N. On the Berriman is a 65′ incline, with stopes to the surface. Two pay-shoots on the Dromedary pitch south. The mine is idle. An incorporated company, of Grass Valley, owner; N. Berriman, of Grass Valley, manager.

Big Blue Mine (Quartz).—See Lone Star.

Big Ravine Mine (Hydraulic).—It is 5½ miles N.W. from Nevada City, at 2,600′ elevation, and contains 2 acres of workable ground, on an outbreak from the Blue Tent gravel channel. The gravel bank is 12′ high with 25′ face, contains 65% of cobbles and bowlders, and carries coarse gold. It is worked with 100 miner's inches of water from the Blue Tent ditch, brought through 1,000′ of ditch and 600′ of 7″ pipe, and delivered under 100′ pressure to a 2½″ nozzle. The working is done through 10 boxes, 20″ wide, set on an 8″ grade to the box, using slat riffles; the tailings are dumped behind a crib dam, 5′ high, built on an old reservoir dam in Big Ravine. One man is employed. T. P. Kirkham, of Nevada City, owner.

Birdseye Creek Gold Mining Co.'s Mine (Hydraulic).—It is ½ mile E. of You Bet, at 2,910′ elevation, and comprises 700 acres. The work is on the old Blue Lead channel running N. and S., and has an average width of 500′, with a depth of 300′ of gravel, mostly quartz. About 1 mile of the channel has been worked. At present only ground-sluicing. The water is taken from the head of Steep Hollow, through 12 miles of ditch, with a ⅜″ per rod grade, 4′ on top, 3′ on the bottom, 2′ deep, and with a capacity of 1,400 miner's inches, delivered under 250′ head, through 1,000′ of 22″ pipe. Twenty-five men are employed. C. Goodwin, of You Bet, owner.

Black Prince Mine (Quartz).—See Mountaineer.

Bluejay Mine (Quartz).—It is 5 miles N.E. of Washington, adjoining the Central Mine, at 4,250′ elevation. The vein strikes W. of N., dips 65° E., in granite, and shows 4′ of quartz. The development consists of a 300′ tunnel, and a 100′ shaft sunk below the tunnel level at a point 200′ from the mouth. This shaft passes through the pay-shoot, which is 100′ long, pitching south. The quartz carries about 3% sulphurets. Some stoping has been done, both above and below the tunnel level. For hoisting, a windlass run by water-power is used, and the 2″ double-action pump is driven by a hurdy wheel, under 150′ pressure, with water obtained from Fall Creek, through 6 miles of ditch of 100 miner's inches capacity. A 5-stamp mill, with 750-lb. stamps, driven by a 4′ Pelton wheel under 200′ head, requiring 15 miner's inches of water, is attached to the property. Below the mill is a small canvas plant of four sections, each 18′ long. The mine has been idle for two months, but employs, when working, 5 men. M. H. Baugh and G. Bouney, of Washington, owners.

Blue Lead Mine (Drift).—It is in Logan Cañon, ¾ mile from Relief Hill, at 3,650′ elevation, and comprises 480 acres on a lava-capped channel having a N. and S. course. It is worked through a bedrock tunnel 2,500′ long, which is being driven ahead; at the present no gravel is being breasted. The channel, 20′ and over above the main tunnel, is worked through an upraise connecting the two. The dimensions of the main tunnel are 6½′ high, 4½′ wide on top, 7′ on bottom; the back portion of the tunnel is in swelling ground. The gravel drifts are carried 6′ high; the ground is hard-picking, and contains some very large bowlders; the gold is of medium size. The dump has a capacity of 100 tons, the gravel being washed once a week through 18″ flumes set on a 9″ grade, with free water for five months, and with water from Malakoff ditch the remainder of the season, using 150 miner's inches. Five men are at work. A. Roach, Ch. Haggerty et al., of Moore's Flat, owners.

Boss Mine (Quartz).—See North San Juan Co.

Boston Ravine Mine (Quartz).—See Massachusetts Hill.

Brandy Flat Mine (Drift).—It is near Moore's Flat, and comprises 15 acres. The channel is being worked through a bedrock tunnel 150′ long, with a 20′ upraise to the gravel, which is worked 6′ high, and timbered with post and cap. The numerous big bowlders are removed by blasting. A breaster takes out 2 tons of gravel per shift; the gravel contains coarse gold. Four Chinese are at work. Ah Moy, of San Juan, owner.

Brunswick Consolidated Mine (Quartz).—See our VIIIth, Xth, XIth, and XIIth Reports, pp. 431, 381, 274, and 186. It is 2½ miles S.E. of Grass Valley, on Sec. 25, T. 16 N., R. 8 E., at 2,800′ elevation. The main three-compartment shaft is down 800′, and is furnished with a pumping and hoisting plant and a Rix double compressor; the power is water, acting on Pelton wheels. Fifteen men are employed. J. M. English, of San Francisco, owner; F. Niles, of Nevada City, superintendent.

Buckeye Mine (Quartz).—It is 3 miles N.E. from Nevada City, at 2,600′ elevation. The vein strikes N. and S., and dips 60° W. between slate and granite walls, showing from 1′ to 3′ of quartz. The main tunnel is 500′ in length on the vein, cutting two ore-shoots that have been stoped from this level about 120′ to the surface. From the bottom of the 210′ main incline a drift has been run both 150′ N. and 300′ S., and some stoping done. A second incline, 90′ deep, has been sunk to the N., in good ore. Two men are employed. T. B. Gray, of Nevada City, owner.

Bullion Consolidated Mine (Quartz).—It is 2½ miles S. of Grass Valley, at 2,400′ elevation. It is supposed to be an extension of the Alaska Mine. The vein strikes N. and S., varies in dip from 15° to 20° E., and is from 2′ to 4′ wide in grano-diorite. It is being worked through a 5′x 13′ double-compartment incline shaft, 240′ on the slope or 100′ perpendicular. The hoist and pump are run by a 40 H.P. steam-engine. The 9″ pump has a 6′ stroke, making 4 strokes per minute. Eleven men are employed. An incorporated company, owner; C. Grow, Mills Building, San Francisco, secretary; W. B. Fowler, of Grass Valley, superintendent.

Cadmus Mine (Quartz).—It is 1½ miles W. from Nevada City, at 2,400′ elevation, and comprises 1,500′ by 600′ on the south side of Deer Creek adjoining the Home Mine. Several veins are on the property, with a general N.W. and S.E. course, but with different dips; the most southerly dips east, the center one perpendicularly, and those beyond to the west. All of them are in slate, though in close proximity to the granite contact. They average 2′ in width. A 5′x 10′ perpendicular shaft, well timbered and lined, reaches 120′ to date, but will be continued to 200′ in depth. At 50′ a drain tunnel from Deer Creek taps the shaft. Tunnels have been driven from the creek on each of the veins, the longest extending 300′ and showing a 2′ vein of quartz, carrying iron, copper, and lead sulphurets. Four miner's inches of water are pumped from the shaft with a 10″ jackhead pump, which, as well as the hoist, is driven by two 4′ Pelton wheels, working under 193′ pressure, with water from the Excelsior Water Co.'s ditch. The pump has a 5′ stroke, and makes 8 strokes per minute. Eleven men are employed. An incorporated company, of San Francisco, owner; C. Kahl, of Nevada City, superintendent.

Caledonia (*Montreal*) *Mine* (Quartz).—It is on Old Man Mountain, 3 miles N.W. from Meadow Lake, at 7,400′ elevation, and comprises 3,000′ by 600′. The vein, 8′ to 9′ wide, strikes N.W. and S.E., and dips S.W., between syenite walls. There are two tunnels, each about 150′ long, and several surface cuts. The quartz is heavily mineralized, and said to carry 7% of sulphurets. Three men are employed. W. H. Leman and J. Williams, of Cisco, owners.

California Mine (Quartz).—See our XIth Report, p. 308. It is 4 miles W. of Grass Valley, at 2,250′ elevation. An incorporated company, owner; L. E. Clinch, of Grass Valley, manager.

Canada Hill Consolidated (*Charonatte*) *Mine* (Quartz).—It is 1½ miles S.E. from Nevada City, at 2,760′ elevation, and comprises 55 acres of patented ground. There are four veins along the granite contact striking N. and S., and dipping both E. and W. They vary in width from 3″ to 20″ and are heavily mineralized, the ore being of similar character to the Beckman vein, in the Mayflower Mine, and high-grade in places. The old workings in this mine, said to be 1,300′ deep on the slope, are inaccessible, on account of water; the recent works are confined to what is designated as the Grant vein, where a 300′ incline 5′x 7′ shaft has been sunk. Short drifts at the bottom expose a 16″ vein. The incline is tapped at 125′ by a short drain tunnel. The old incline was similarly tapped at 200′. There is a hoist at the shaft worked by an 8′ wheel, under 432′ pressure, taking water from South Yuba Ditch Co., through 2,800′ of 18″ to 7″ pipe. The water from the Grant shaft is raised by an "ejector." The mine is under bond, and idle. G. C. Gaylord, of Nevada City, owner.

Cedar Mine (Quartz).—See our XIIth Report, p. 186. It is in Bear River District, 14 miles from Grass Valley, on Secs. 20 and 29, T. 14 N., R. 8 E. J. R. Nickerson, of Auburn, Placer County, owner.

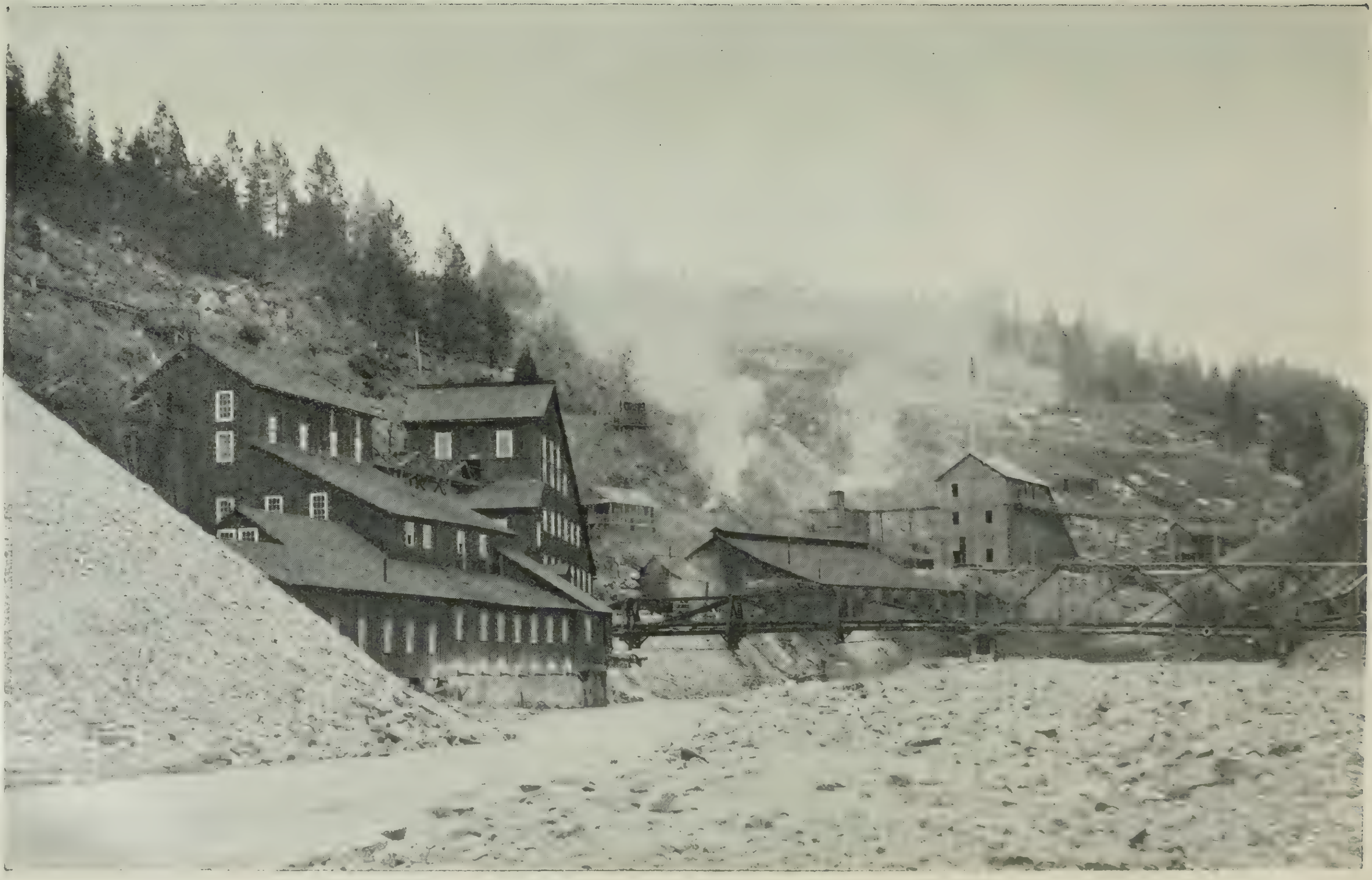
Centennial Mine (Quartz).—See our XIth and XIIth Reports, pp. 280 and 186. It is near the summit of Osborn Hill, 2 miles S.E. of Grass Valley, at 3,000′ elevation. H. Sylvester, of Grass Valley, owner.

Centennial Mine (Quartz).—It is 7 miles N.E. of Washington, on Cañon Creek, at 4,500′ elevation. The 1′ wide vein strikes N. and S., and dips 60° E. in protogene. There are three tunnels on the vein; No. 1 is 120′, No. 2 is 90′, and No. 3 is 90′ long, giving from the lowest tunnel 300′ of backs. Two men are employed. Marcot & Nelson, of Washington, owners.

Central and Gray Eagle Mines (Quartz).—They are 5 miles N.E. of Washington, at 4,025′ elevation, and comprise three claims. The 4′ vein strikes N. and S., and dips 60° E., near the slate and granite contact. The developments consist of several shallow shafts and a 60′ tunnel cross-cutting for the ledge. Two men are at work. Tiernan & Richards, of Washington, owners.

Central Gravel Mining Co. (Drift).—See our XIIth Report, p. 186. It is 10 miles N.E. of Nevada City, at 3,800′ elevation, and comprises 170 acres. The main tunnel has been extended 200′, making it 1,100′ in length. Seven men are employed. Central Gravel Mining Company, of Sacramento, owner; Mr. Fold, of Nevada City, superintendent.

Central North Star Mine (Quartz).—See our XIth and XIIth Reports, pp. 277 and 187. It is 2 miles S. of Grass Valley, at 2,480′ elevation,



Champion Mine, Mills, and Furnace.

and comprises two claims, one 1,500′ by 600′ and one 1,200′ by 600′. The 2′ vein strikes E. and W., and dips 20° N., in diabase. Central North Star Mining Co., owner; J. Bennallack, of Grass Valley, superintendent.

Central Pacific Mine (Quartz).—See our XIIth Report, p. 187. It is ¾ mile S.W. from Rough and Ready. Idle. Moody & Gayety, of Gold Run, Placer County, owners.

Champion Consolidated Mine (Quartz).—See our VIIIth, Xth, XIth, and XIIth Reports, pp. 420, 386, 286, and 187. It is on Deer Creek, 1 mile W. from Nevada City, at 2,400′ elevation, and comprises over twenty-three claims, including the *Merrifield* and *Wyoming*. Four veins are included in the property. Since our last Report, the mine was idle for a considerable period, through legal complications, causing considerable repair work on resumption of operations. The 5½′x 15′ three-compartment main incline has been continued to 1,400′ in depth. Large ore-bodies are being stoped between the 1,000′ and 1,200′ levels, and the drifts extend over 800′ N. from the shaft. A new 5′x 8′ shaft has been started on the *Merrifield*, and has reached 300′ in depth. The crushing capacity has been increased by the addition of a new 40-stamp mill, of 1,000 lbs. each, making 70 stamps in all. The chlorination works have been enlarged from a 3-ton to a 4-ton capacity per day, by the addition of extra vats. An electric-light plant has likewise been added, consisting of a Westinghouse 110-volt dynamo, furnishing 85 incandescent lights of 16 candle-power. The power is obtained from the Excelsior Water Co.'s Ditch, the water being applied to 13 Pelton wheels. The working force consists of 125 men. Champion Consolidated Gold Mining Co., of No. 314 Crocker Building, San Francisco, owner; J. F. Holbing, secretary; Fred Zeitler, of Nevada City, superintendent.

Charonatte Mine (Quartz).—See Canada Hill.

Coan Mine (Quartz).—It is 3 miles W. of Nevada City, at 2,425′ elevation. The vein strikes N.W., and dips 45° S.W. along the contact, from 18″ to 3′ wide. There is a 100′ incline, tapped at 40′ by a 100′ drain tunnel, and from the bottom of the shaft extend two short drifts, about 50′. A 4-stamp mill, to be run by water-power, is on the ground, though not yet erected. A friction hoist and bucket pump are arranged to be run by Pelton wheels. The mine is idle. M. Coan and partner, of Nevada City, owners.

Coe Mine (Quartz).—See Lone Star.

Columbia (*White Ledge*) *Mine* (Quartz).—It is 2 miles N. from Meadow Lake, at 6,900′ elevation. The vein courses N.W., and dips S.W., between slate walls varying from 6″ to 2′ in width. There are two shafts on the vein, 100′ deep, and a long cut on the outcrop. Two men are employed. R. A. Campbell, of No. 1014 Sixteenth Street, Oakland, owner.

Congo Mine (Quartz).—See Goodall Consolidated Gold.

Conlon Gold Mining Co.'s Mine (Quartz).—See our XIIth Report, p. 187. It is on Osborne Hill, 2½ miles S.E. from Grass Valley, at 2,900′ elevation. Conlon Gold Mining Co., of Grass Valley, owner.

Constitution Mine (Quartz).—See Jesse Consolidated.

Crown Point (*William Penn*) *Mine* (Quartz).—See our VIIIth Report, p. 429. It is in the suburbs of Grass Valley, at 2,350′ elevation. The property embraces two claims, and has been idle for a number of years, but is at present being reopened by a French syndicate. The old 10-

stamp mill is to be enlarged by the addition of 10 stamps and the required number of concentrators. The company own their own water-power, taking it from Wolf Creek through 1 mile of ditch, with a grade of ½″ per rod. Eighteen men are employed. Crown Point Mining Co., of Paris, France, owner; — Berteaux, secretary; M. Chambry, of Grass Valley, superintendent.

Culbertson Mine (Quartz).—See our XIIth Report, p. 188. It is 2 miles W. from Graniteville, or Eureka, at 4,110′ elevation. The vein strikes N. 18° W., dips 50° E., in a clay-slate formation, and is from 1′ to 6′ wide. The quartz is said to carry from ½% to 1% of iron sulphurets. A 5′x 11′ 8″ (in the clear) three-compartment incline is 70′ deep and has a hoist and two 10″ pumps, a bucket, and a plunger working at 8 strokes of 6′ per minute. The entire plant is run by a 6′ Pelton wheel, under 300′ pressure, taking 45 miner's inches of water from the Eureka Lake Ditch Co., brought through 600′ of 11″ to 7″ pipe. There are also two 2½″ ejectors working under 300′ pressure, which raise the water 70′. On account of the very wet and heavy ground the timbers have to be set very close. The drain tunnel, 350′ long, taps the incline at 70′. Thirty miner's inches of water passes through the drain tunnel. The ore is trammed to the adjacent 10-stamp mill, which carries 1,000-lb. stamps. The mill has no concentrators, but a canvas plant of 6 sections, each 16′ long, and sluices with Hungarian riffles, are below the aprons. The mine is only run during the summer season, when 20 men are employed. D. Moore and partner, of Graniteville, owners.

Cyane Mine (Quartz).—See Jesse Consolidated.

Daisy Hill Mine (Quartz).—It is 2 miles S.E. of Grass Valley, at 2,700′ elevation. The vein strikes N. and S., and dips W., on what is supposed to be an extension of the Rich Hill vein of the Ophir Mine; it is from 3″ to a few feet wide, between a slate foot-wall and grano-diorite hanging-wall, and is said to carry a good grade of sulphurets. There is an incline shaft 250′ deep, besides a number of shallow shafts; drifts have been extended 300′ to 400′ from the incline, and on the north side it has been stoped up to the surface. A steam hoist and pumps are at the shaft. Idle. C. Kingsley, of San Francisco, owner.

Deadwood Mine (Quartz).—It is 2½ miles E. from Nevada City, at 2,650′ elevation, and comprises 95 acres of patented ground. The 20″ vein strikes N.E., and dips 25° N.W., in granite. The vein is very heavily mineralized, and the sulphurets are said to be of a very good grade. A 550′ shaft has been sunk on the vein, and a 1,200′ tunnel taps the shaft at 158′ from the surface. Three pumps, 10″, 6″, and 4″, as well as the hoist, are driven by a 12′ hurdy wheel, under 320′ head, with 15 miner's inches of water from the Snow Mountain ditch, and through 1,200′ of 7″ pipe. The 8-stamp mill has been burned.

Delaware (*West Harmony*) *Mine* (Drift).—It is 2 miles N.E. from Nevada City, at 3,075′ elevation, and comprises 140 acres, including the West Harmony ground, which is practically worked out. The present workings are down stream, on the Harmony channel, where two parallel gangways are being driven, about 60′ apart, down the center of the channel, to permit of breasting out the ground up stream. The old West Harmony incline, 520′ long, is made use of with a 6′x 7′ gangway, 1,100′ long. The breasts are carried 4′ to 6′ high, and from 60′ to 100′ wide. The gravel is partially cemented, and carries 66% of cobbles and bowlders, which are stored. The gravel is crushed in a 15-stamp water-power mill with 800-lb. stamps and No. 12 steel wire screens, running at 84 drops and crushing 120 tons per day with chrome steel shoes and dies. The timbering is expensive, on account of swelling ground; the breasts are secured with sets, and lagged overhead. Forty men are employed. R. McMurray and W. H. Martin, of San Francisco, owners.

Delhi Mine (Quartz).—See our VIIIth and XIth Reports, pp. 444 and 305. It is 3½ miles W. from Columbia Hill, at 2,500′ elevation. Idle. Delhi Mining Co., of North Columbia, owner.

Derbec Mine (Drift).—See our VIIIth and XIth Reports, pp. 456 and 311. It is 1 mile N.W. from North Bloomfield, at 3,780′ elevation. Idle. Derbec Blue Gravel Mining Co., of San Francisco, owner.

Diamond Creek Consolidated (*Eagle Bird*) *Mine* (Quartz).—See our VIth (Part II), Xth, and XIIth Reports, pp. 51, 389, and 188. It is at Maybert, at 3,000′ elevation. Since our last Report the main shaft has been sunk 100′ farther, and a new hoist, compressor, and 30 stamps and 4 Johnston concentrators erected. The mine is not working; only the water is being kept out and the sawmill running, employing 6 men. Diamond Creek Consolidated Gold and Silver Mining Co., of Kansas City, Mo., owner; C. A. Lilly, of Maybert, manager.

Diamond Mine (Quartz).—See our XIIth Report, p. 188. It is 2 miles S. of Grass Valley, at 2,400′ elevation, and comprises 69.72 acres under agricultural patent. The vein strikes N., and dips 38° E., in a syenite formation, and is from 18″ to 3′ wide. There is a 90′ perpendicular shaft turned to an incline for 70′ farther, to reach the vein in the hanging-wall, which is here 3′ wide. Idle. H. G. Leman, of Grass Valley, owner.

Diamond (*Pacific*) *Mine* (Quartz).—It is near Meadow Lake, at 7,200′ elevation. The vein, averaging 6′ in width, courses N.W., and dips 45° S.E., between syenite walls. There is a double-compartment shaft, at present filled with water, said to be several hundred feet deep, and several open cuts on the outcrop of the vein. Two men are at work. W. H. Leman and J. Williams, of Cisco, owners.

Dillon Mine (Quartz).—It is 1 mile S.E. of Graniteville, at 5,100′ elevation, and comprises two claims. There are several veins running through the property with a general N.W. strike, approaching each other going S.; their dip is from 65° to 75° W., in granite near the contact of slate, and they vary in width from seams to several feet. The mine is opened by a 60′ tunnel on one of the veins, thence a 204′ crosscut through two other veins, while those farther south were not reached. A 105′ air-shaft ventilates the tunnel. The first vein has been stoped 75′ from the surface. A 72′ winze below the tunnel shows a 2½′ vein in the bottom. A 4-stamp water-power mill, with 650-lb. stamps, crushes 8 tons in twenty-four hours. The property is not worked during the winter. Seven men are employed during the summer. Foley & Hibbard, of Eureka, owners.

Eagle Echo Mine (Drift).—It is on Relief Hill, at 2,700′ elevation, and comprises 15 acres of the Eureka Lake Co.'s ground. There is a 70′ perpendicular shaft leading to a drift 3,700′ in length, with an incline at the end; the gravel is raised up the incline with a whip. The gravel is loose, and is breasted out 6′ high, 65′ wide, and timbered with post and cap, lagging up the roof. Six men are breasting, taking out, per day, 36 to 45 carloads of 2,500 lbs. The dump holds 100 loads, and is washed every day, through 18″ flumes set on a 1″ to 1′ grade, lined with 6″ blocks, 17″

square. The tailings dump into Logan Cañon. For six months free wash-water is obtained from neighboring cañons; the remainder of the season 200 miner's inches are obtained from the Bloomfield ditch, for one hour per day. Sixteen men are employed. Eureka Lake Co., of San Francisco, owner; R. H. Penrose, of Relief Hill, lessee and manager.

Eagle Bird Mine (Quartz).—See Diamond Creek Cons.

Echo Mine (Drift).—See Eagle.

Electrical Mining Co.'s Green Mountain, Sanders, and Redan Mines (Quartz).—They are on Osborne Hill, 3 miles S. of Grass Valley, at 2,780′ elevation, and comprise 3,000′ by 600′. The vein strikes N.W., and dips 38° W., in diorite. The main incline, 600′ deep, is being pumped out. The plant consists of a steam hoist and pumps and a 20-stamp steam-power mill, with 1,000-lb. stamps, and 8 Frue vanners. Two men are employed. Electrical Mining Co., of San José, owner; D. Coughlin, of Grass Valley, superintendent.

Empire (*Ophir*) *Mine* (Quartz).—See our VIIIth, Xth, XIth, and XIIth Reports, pp. 426, 371, 272, and 189. It is 1 mile E. of Grass Valley, at 2,650′ elevation, and comprises six claims with several veins; the principal ones are the *Ophir* and the *Rich Hill* vein, which is about 15″ in width, strikes N.W. and S.E., and dips 30° S.W., between a diabase footwall and a diorite hanging-wall. The main working shaft has reached a depth of 2,100′ on the incline, and drifts extend over 2,000′ from it. Two pay-shoots, pitching S.E., have been worked to over 1,800′ in length on the Ophir, and a shorter distance on the Rich Hill. The entire works are driven by water, under 420′ head, derived from the Grass Valley Water Co., with auxiliary steam for the pumps in case of accident to the water supply. Two Rand drills are used, the compressor only running one side. The 40-stamp mill, with 850-lb. stamps, is equipped with 16 Triumph vanners, and 42 tons of high-grade sulphurets per month are produced and sold in open market. One hundred and forty-five men, including tributers, are employed. R. Walker, of Grass Valley, superintendent.

English Co.'s (*Badger Hill*) *Mine* (Quartz).—See our XIIth Report, p. 185. It is 1 mile S.E. of Cherokee. Badger Hill Mining Co., of North San Juan, owner.

English Mountain Gold Mining Co.'s Mine (Quartz).—It is 20 miles W. of Emigrant Gap, at 8,000′ elevation, and comprises three full claims. The 6′ vein strikes N. and S., and dips 75° W., in syenite. The ore carries 1½% of sulphurets of low grade. The mine is opened through three tunnels, giving from 80′ to 300′ of backs; the ground between Nos. 1 and 2 is stoped out; No. 3, now 1,150′ long, is being driven ahead. There is a Hallidie rope tramway, 2,000′ long on 33° grade, down to the mill, and has a capacity of 200 tons in ten hours. The 20-stamp steam-power mill has 1,000-lb. stamps run at 84 drops per minute, crushing 40 tons per day, with a consumption of 3¼ cords of wood per day. Forty-five men are employed. F. L. Underwood, of New York, owner; C. H. Mallen, of Nevada City, superintendent.

Ethel Mine (Quartz).—See our XIIth Report, p. 189. It is between Bear and Yuba rivers, 2½ miles N. from Emigrant Gap, at 4,975′ elevation. The vein, 18″ to 30″ wide, strikes N. and S., and dips 37° E., between grano-diorite walls. It is opened through a 4½′x 10′ incline, 80′ deep, furnished with a patent horse-whim. At the bottom of the incline drifts have been turned 50′ N. and 55′ S. The quartz is somewhat glassy, and is stated to carry 2½% of sulphurets. Six men are employed. The property is leased to W. W. Mendenhall, of San Francisco. South Yuba Ditch Co., owner.

Excelsior Mine (Quartz).—It is ½ mile W. of Meadow Lake, at 7,100′ elevation. The vein, of great prominence and width of outcrop, exceeding 45′ in places, courses N.W. and S.E., and has been worked in numerous places along the outcrop, the ore being crushed in the 10-stamp steam-power mill. Idle at present. Mrs. H. Hartly, of Carson, Nev., owner.

Federal Loan Mine (Quartz).—See our XIth and XIIth Reports, pp. 290 and 189. It is on Deer Creek, 4 miles E. from Nevada City, at 2,760′ elevation. Since our last Report the main shaft has been lowered from the 500′ to the 800′ level, where the vein shows only stringers of quartz, rich in free gold. A 300′ drift extends E. from the 500′ level, and also one at the sixth, and a 700′ drift on the seventh station, below which a 40′ winze has been sunk, tapping the top of a new ore-shoot which is to be opened by the present eighth level, which is now 300′ long. The machine plant has been increased by an Ingersoll compressor for five drills, driven by a 4′ Pelton wheel, under 350′ pressure. New 6″ and 8″ pumps and a No. 3 blower to aid the ventilation, have been added in the shaft, and a 6′ improved Triumph vanner and canvas tables to the mill. The mill is idle, and awaits the completion of No. 8 level to the new ore-shoot. Both quartz and its 4% sulphurets are high-grade. Water is obtained from the South Yuba ditch for five Pelton wheels, requiring 35 miner's inches. Twelve men are employed. An incorporated company, of Nevada City, owner; J. O. Neal, secretary; J. Vincent, of Nevada City, superintendent.

Fisk (*Ogdensburg and St. Lawrence*) *Mine* (Drift).—It is 9 miles N. from Emigrant Gap, at 5,850′ elevation, and comprises 140 acres. This is on what is supposed to be the Omega channel, coming through the Gold Lake country of Sierra County. The general course is N.E., and the gravel is from 1′ to 23′ in thickness, with some cement capping. The channel appears to fork on this ground or else to form a horseshoe, and the tunnel, 130′ long, cuts diagonally across the front portion, and is to be continued to the back part, about 75′ ahead. Breasting on the tunnel level is carried 8′ wide and 6′ high, and the gold found is of a heavy, nuggety character. During the summer months surface gravel is washed through a 16″x 18″ flume, 150′ long, set on a 10″ grade, and paved with pole and Hungarian riffles, with 150 miner's inches of free water from Nagle and Mooney creeks. The tailings dump into Mooney Creek. The surface workings have a bank 18′ high and 200′ long. Three men are at work. — Fisk et al., of Washington, Nevada County, owners.

Forest Mine (Quartz).—It is 3 miles from Nevada City, at 2,450′ elevation. The 6″ to 2′ vein strikes E. and W., and dips nearly vertically, between slate and grano-diorite. The quartz horns well in free gold, and carries considerable sulphurets. Mining is carried on through a 4′x 4½′ incline, which is being sunk 150′, and is now 30′ deep. The hoist and 7″ pump are run by water-power, using a 6′ Pelton wheel for the hoist and a 9′ one for the pump. The water, amounting to 10 miner's inches, is free, and obtained from Ragon Flat. Four men are at work. W. Green and R. Hughes, of Nevada City, owners.

Forest Springs Quartz Mining and Lumber Co.'s Mine (Quartz).—See Norambagna.

Forlorn Hope Mine (Quartz).—It is on the banks of Deer Creek, 2½ miles N. from Rough and Ready, at 1,580′ elevation, and comprises 3,000′ by 600′. The 18″ to 24″ vein strikes N. 8° E., and dips 30° W., in grano-diorite. Three tunnels have been driven on the vein: No. 3, starting near the creek, is between 400′ and 500′ long, intersecting, at 225′ from its mouth, a 5′x 9′ incline shaft, which extends 200′ below the tunnel on the slope of, and showing a good vein in the bottom. The collar of the shaft is 100′ above the tunnel level on the slope. Tunnel No. 2 is 35′ perpendicularly above No. 3, and extends 325′ along the vein. Near the end of the tunnel a vein, striking N.E., and 4′ wide, cuts through the N. vein, with 25° dip. The shaft is provided with a hoist and a 6″ pump, run by water-power, derived from the Excelsior ditch. An old 5-stamp mill, with 750-lb. stamps, run by water, stands below No. 3 tunnel. One man is at work. An incorporated company, of Smartsville, owner; J. Driscoll, secretary; W. W. Chamberlain, of Smartsville, manager.

Fountain Head Mine (Drift).—It is 3 miles N.E. from Nevada City, at 2,650′ elevation, and comprises 373 acres of patented ground, extending 1 mile along Washington Ridge. There is an incline 100′ deep, which will have to be extended 340′ to reach the bedrock of the channel. There is a 6″ pump and a hoist driven by water-power. Idle. Fountain Head Gravel Mining Co., owner.

Friendly Peace Mine (Quartz).—It is a prospect, 1 mile N.E. from Maybert, at 3,450′ elevation. The 2′ to 3′ vein strikes W. of N., and dips 60° E. A drift has been started on the vein, and is 25′ long. One man is at work. H. W. Cole, of Maybert, owner.

Gambrinus Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 451 and 189. It is on Mill Ravine, 5 miles W. from Washington, at 5,070′ elevation. Idle. J. McBean et al., of Washington, owners.

Georgia Mine (Placer).—It is 1½ miles E. of Eureka, in Sec. 10, T. 18 N., R. 11 E., on South Fork Creek, at 5,400′ elevation, and comprises 20 acres. The gravel is 2′ deep, carrying large bowlders, and contains coarse gold. The water season lasts three months. One man is at work. G. O. Rooker, of Eureka, owner.

German Mine (Quartz).—It is 3½ miles E. of Washington, at 2,800′ elevation, and comprises two quartz claims, 80 acres of placer, and 160 acres of agricultural ground. There are two parallel veins which strike N. and S., and dip 15° E.; the main vein is from 4′ to 5′ wide, between a slate hanging-wall and a diorite foot-wall. It opened through two tunnels; the lower one is 800′ and the upper one 250′ long. Very little stoping has been done. On the pay-shoot the quartz shows coarse free gold. Below the tunnels is a 10-stamp water-power mill, with a chute from the tunnel for conveying the ore. The stamps weigh 1,000 lbs., and the mill is run at a speed of 80 drops per minute of 5″ drop and 6″ discharge, using No. 35 brass wire screen, and with a capacity of 20 tons per day. The apron-plates are set on a grade of 1½″ to 1′. There are four sections, each 12′ in length, of the canvas plant, but no concentrators. The water-power is taken from Cañon Creek, through 2 miles of ditch of 350 miner's inches capacity, delivered through 2,000′ of 11″ and 8″ pipe to a 4′ Dodd wheel, under 206′ pressure. Ten men are employed. An incorporated company, of Shasta County, owner; D. Harmon, of Nevada City, manager.

Giant King Mine (Quartz).—It is 1½ miles S. of Washington, at 3,100′ elevation, and comprises three claims. The strike is N. 60° W., and dip 50° E., between slate and porphyry walls. There are two tunnels: No. 1, which is 100′ vertically below the outcrop, cross-cuts 180′ to and 74′ through the vein; No. 2, at a vertical depth of 254′, cross-cuts 486′ to the vein and is continued across it. The quartz carries from 1% to 3% of sulphurets, mostly iron and lead. Two men are at work. W. L. Williamson and M. N. Cole, of Washington, owners.

Glencoe Mine (Quartz).—It is 2 miles S.E. from Nevada City, adjoining the Banner Mine on the south, at 2,600′ elevation, and comprises 3,000′ by 600′. The vein strikes E. and W., and dips nearly vertically in slate, about 300′ from the contact. It is from 3′ to 11′ in width, heavily mineralized, and said to contain 5% sulphurets. It is worked through tunnels and a shaft, the latter 150′ deep, and will ultimately connect with the former. The two tunnels are run 600′ on the vein. Two men are at work. Nevers & Sharpe, of Nevada City, owners.

Glenn Mine (Quartz).—It is 1¼ miles S.E. of Eureka, at 4,950′ elevation, and comprises four claims, known formerly as the *Annie*, *Illinois*, *Russell Ravine*, and *Stacey*. The veins strike N. and S., and dip from 50° to 70° E., with respective widths of 3′, 2′, 2′, and 2′, all in granite in proximity to the slate. The Stacey claim has a tunnel 1,200′ long, which likewise cuts the Illinois. There are two ore-shoots on the Stacey, 260′ and 150′ long, and one on the Illinois, 200′ in length. The two veins are about 100′ apart, and the tunnel gives 250′ of backs. On the north shoot of the Stacey is a double-compartment shaft, which has a depth of 300′ below the tunnel level. The Russell Ravine claim has been leased to other parties. Two men are at work. F. M. Carter and C. D. Eastman, of Eureka, owners.

Gold Bank Tunnel Company.—This is a corporation formed to run a drain tunnel from Jones' Bar, on the South Yuba River, 4½ miles S. from Grass Valley. It is to run 4½ miles N.E., and then to turn south. Preliminary work has been performed for the purpose of locating the line of the main tunnel. It has been figured that 66,000,000 tons of ore will be available above the tunnel level. Gold Bank Tunnel Co., owner; G. E. Johnson, of Nevada City, secretary; F. Burns, of Nevada City, manager.

Gold Flat Mine (Quartz).—See Mohican.

Gold Flat (*Potosi*) *Mine* (Quartz).—See our XIIth Report, p. 189. It is 1 mile S. from Nevada City, at 2,650′ elevation, and comprises 2,870′ by 400′ at one end, and 600′ at the other end line, in Secs. 24 and 13, T. 16 N., R. 8 E. Idle. An incorporated company, of Grass Valley, owner; J. Skewes, of Grass Valley, superintendent.

Gold Hill (*Nevada City*) *Mine* (Quartz).—See our VIth (Part II), VIIIth, XIth, and XIIth Reports, pp. 49, 418, 378, 288, and 190. It is situated on the southwest edge of Nevada City, at 2,450′ elevation. Electrical power is being introduced at the mine, preparatory to pumping it out. Twelve men are at work. An incorporated company, of San Francisco, owner; F. Dawson, of Grass Valley, superintendent.

Gold Point Mine (Quartz).—It is 2 miles E. of Grass Valley, at 2,630′ elevation, and comprises 3,000′ by 600′ of patented ground. There are two parallel veins on the property 70′ apart, with a N. 34° W. strike and 75° S.W. dip. A tunnel runs from Little Wolf Creek 600′ to the vein, and then turns on the vein, passing through 400′ of a pay-shoot, exposing a 3′ vein. A two-compartment shaft has been sunk 170′ to the tunnel level with a steel horse-whim. There is a 10-stamp water-power mill, with 1,000-lb. stamps, and two Hendy-Norbaum concentrators. Power is taken from the Empire pipe. Idle. An incorporated company, of Grass Valley, owner.

Gold Tunnel Company (Quartz).—It adjoins the Mountaineer Mine, ½ mile W. from Nevada City, at 2,340′ elevation, and comprises 3,200′ by 600′. The vein strikes N. 8° E., and dips 30° E., with an average width of 12″ in granite. Three tunnels have been opened from Deer Creek, and two small shafts sunk on the summit of Lost Hill. The main tunnel is 200′ long; the other lower tunnels have had to be abandoned for the present. About 700′ from the tunnel mouth the vein shows a split, one branch diverging from the true course to the N.E., but uniting again 200′ beyond. The ore above water-level is high-grade where it contains ochre. The old workings of this mine, now inaccessible, reached to a depth of 720′ on the slope of the vein, and are said to have been very productive. The ore is crushed in the Nevada County Co.'s mill. Four men are employed. A. D. Allen, of Nevada City, owner; S. Butler et al., of Nevada City, lessees.

Golden Chain Mine (Quartz).—See Syndicate.

Goodall Consolidated Gold Mine (Quartz).—It is in Sec. 1, T. 15 N., R. 8 E., 3½ miles S.E. from Grass Valley, at 2,600′ elevation, and comprises six locations, five of which are full claims, and one 1,100′ by 600′; they are the *Congo*, *Goodall*, *Gov. Perkins*, *Manhattan*, *Oro Fino*, and *South End*. Various prospect shafts and tunnels have been run at different points. The South End claim has three parallel veins about 150′ apart which strike N. and S., and dip about 40° W. The two most easterly veins have been worked by two tunnels, one of which has been run 500′ on the vein, 100′ from the surface; the other tunnel, 250′ long on the vein, gives 60′ of backs. The ground above these tunnels is stoped. These veins are along the diorite and slate contact, and show in the tunnels an average width of 2′. Idle. An incorporated company, owner; W. Berry, of Grass Valley, manager.

Gov. Perkins Mine (Quartz).—See Goodall Consolidated.

Grant and Canada Hill Mining Co.'s Mine (Quartz).—See our XIIth Report, p. 190. It is 2½ miles N.E. of Nevada City. Idle. W. Veal, of Nevada City, lessee.

Granite Hill Mining and Development Co.'s Mine (Quartz).—It is 1 mile S. of Grass Valley, at 2,250′ elevation, and comprises 3,000′ by 600′. The vein courses a little E. of N., and dips W., varying from 25° to 50°, next to a rolling foot-wall. The formation is diorite; the vein, running into grano-diorite, varies from 3″ to 2½′ in width, and is said to carry as high as 6% of high-grade sulphurets with spar. It is opened by a 5′x 12′ three-compartment incline, 600′ deep, with levels of 200′ to 300′ long, both N. and S., at every 100′. The pay-shoot, from 50′ to 70′ long, pitches S., and is being stoped between the third and fifth levels. The hoist, pumps, and mill are run by water-power from Wolf Creek, through ¾ mile of ditch. There are 10″, 8″, and 7″ pumps. The mill has 5 stamps of 850 lbs. each, and is run by a 6′ Pelton wheel under 60′ head; it is furnished with a Woodbury concentrator. Thirty-three men are employed. An incorporated company, of Sacramento, owner; T. F. Phillips, of Grass Valley, superintendent.

Grass Valley Tunnel Co.—See Treadwell Tunnel Co.

Gray Eagle (*Dutch Flat, Sunny South*) *Mine* (Quartz).—It is 10 miles N.E. from Cisco, at 6,825′ elevation. The vein is 15′ wide, strikes N.W. and S.E., and dips 55° S.W., between granite walls. There are two open cuts, 60′ in length, along the outcrop. Two men are employed. R. A. Campbell, of No. 1014 Sixteenth Street, Oakland, owner.

Great Britain Mine (Quartz).—See Massachusetts Hill.

Great Eastern Mine (Quartz).—See Syndicate.

Green Mountain Mine (Quartz).—See Electrical Mining Co.

Greystone Mine (Quartz).—It is 5 miles S.W. from Graniteville, at 4,000′ elevation. The vein has a S.E. course with N.E. dip, between serpentine and slate, in an altered contact rock, from 30′ to 60′ wide, which contains pockets of gold. There is a 200′ open cut and a 40′ tunnel. Two men are at work. J. Bander et al., of Moore's Flat, owners.

Grub Stake (*California*) *Mine* (Quartz).—It is at Meadow Lake, at 7,225′ elevation. The vein, 8′ to 45′ in width, courses E. and W., and dips 50° N., between syenite and diorite porphyritic walls, and carries a heavy percentage of sulphurets. There is a three-compartment shaft, now caved, said to be 150′ deep, besides several extensive open cuts along the outcrop. There are on the property a "pulverizer" and several pans, run by steam-power; also a small furnace. Idle. F. Cook and J. P. Clarke, of Cisco, owners.

Harmony Mine (Drift).—See our XIth and XIIth Reports, pp. 298 and 190. It is 2½ miles N.E. of Nevada City, at 2,800′ elevation, and comprises 3,000′ along the Harmony channel. The general course of the channel is E. and W., with a 2.3% grade, and 175′ in width of paying ground. The western half of the ground has been worked, leaving 1,600′ unworked on the east end. The gravel, which is more or less cemented, carries considerable quartz, from a quartz vein passing across the east end of the ground at the contact crossing. The present works are carried on through a 5′x 12′ double-compartment incline, 360′ deep on a 30° grade, equal to 170′ perpendicular depth. The main gangway driven up the channel is carried 6½′ high, 9½′ in bottom in swelling granite bedrock, and is timbered with green-peeled cedar poles, with spruce caps 4½′ long. A spruce set costs $3 50, while with cedar posts the cost is $1 50 per set. The breasts are carried 4′ high and 60′ wide, taking up from 4″ to 6″ of the bedrock. For timbering in the breasts, green-cedar cordwood, split thick, costing $3 50 per cord, is used. The gravel for 18″ next the bedrock contains 50% cobbles and bowlders, while the upper portion contains a certain amount of clay. Sixty-five tons of gravel are taken out per shift by 7 breasters, besides hoisting 40 cars of waste per day. The carmen travel 26 miles per day. In the 175′ width of pay-gravel in the channel runs a serpentine streak of pay of much higher grade than the general average of the channel; thus, while a cross-section of the 175′ is said to yield $1 25 to $2 50 per ton, portions of the channel yield $4 per ton. The gravel when hoisted is trammed to the mill and delivered on grizzlies, with 4″ spaces, dropping into a bin of 250 tons capacity, from where it descends by gravity to the self-feeders. The mill has 10 stamps of 850 lbs. weight, dropping 104 times per minute, with 6″ drop and low discharge, using tin screens, with 12 holes to the linear inch, crushing 120 tons per day, according to the company's statement. An apron-plate 4′ in length is followed by one 3′ in length, with a drop between, and succeeded by 25′ of 14″ sluices furnished with slat riffles. The cost of milling is stated at 13 cents per ton, or for mining and milling 90 cents per ton. The mill is run by a 5′ Pelton wheel under 350′ head, using 10 miner's inches of water. For the hoist and pump a 25 H.P. steam-engine is provided, for cases of emergency. Fifty-six men are employed. Harmony Gold Gravel Mining Co., of Nevada City, owner; K. Casper, secretary; J. C. Hothersoll, of Nevada City, superintendent.

Hartery Consolidated Mining Co.'s Mine (Quartz).—It is ½ mile N. of the Allison Ranch Mine, on the west bank of Wolf Creek, at 2,360′ elevation, 2½ miles S. of Grass Valley. An incorporated company, of Grass Valley, owner.

Henrietta Mine (Quartz).—It is 4 miles N.E. of Cisco, at 7,000′ elevation. The vein, 4′ wide, strikes N.E. and S.W., and dips nearly vertically, between syenite and mica-schist walls. It is a prospect, with an opening 20′ deep on the vein. The ore is crushed by rollers, and washed through a rocker and a short line of sluices. Three men are at work. H. Smith, A. Ashley, et al., of Cisco, owners.

Hirschman Mine (Drift).—See Murphy and Grover.

Holbrooke Mine (Drift).—It is 3 miles W. of Grass Valley, at 2,700′ elevation, and comprises 33 acres on the Alta Hill channel. The mine is worked through a double-compartment incline 168′ deep, and a gangway 115′ long; it will require 25′ more to reach the channel. Steam hoist and pumps are in use. Idle. E. E. Holbrooke, of Grass Valley, owner.

Home Mine (Quartz).—See our XIIth Report, p. 190. It is on Deer Creek, 1½ miles W. from Nevada City, at 2,400′ elevation, and comprises 28 acres. The vein strikes N. 30° W., with a dip W., in slate bedrock. Going north the vein is replaced by a number of veins and veinlets making into the foot-wall. A 5′x 9′ incline has reached 320′ in depth, and will be continued to the 400′ level. A drift on the 200′ level extends 500′ N., and a 400′ cross-cut has been extended into the foot-wall. A 10″ pump, making four 5′ strokes per minute, and the hoists, are operated by 4′ Pelton wheels, working under 200′ pressure, with water from the Excelsior Co.'s ditch. Eight men are employed. An incorporated company, of San Francisco, owner; O. E. Johnson, of No. 316 Front Street, secretary; C. Kahl, of Nevada City, superintendent.

Idaho Mine (Quartz).—See Maryland.

Illinois Mine (Quartz).—See Glenn.

Independence Mine (Quartz).—See Lone Star.

Independence Mine (Quartz).—It is 2½ miles E. of Grass Valley, at 2,700′ elevation, and is an extension of the Maryland Mine. The vein strikes E. and W., and dips nearly vertically. A 4′x 9′ double-compartment shaft, being sunk to strike the extension of the Idaho-Maryland pay-shoot, has attained a depth of 800′, and is being continued. A cross-cut is being started at this depth to cut the vein. The plant comprises a hoist, and two 6″ plunger pumps, making six 6′ strokes per minute, and driven by a 5′ Pelton wheel, taking water from the Empire pipe-line, under 300′ pressure, through 1,100′ of 9″ pipe. The 1″ nozzles are furnished with Chavanne's patented regulator. (See Bulletin No. 9, Mine Drainage.) Ten men are employed. A. Chavanne and D. Frick, of Grass Valley, owners.

Jack Rabbit Mill and Mining Co.'s Mine (Quartz).—See our XIth and XIIth Reports, pp. 278 and 190. It is 4 miles E. of Grass Valley. Idle.

Jesse Consolidated (*Constitution, Cyane, or Mammoth*) *Mine* (Quartz).—It is 3 miles E. of Nevada City, at 2,600′ elevation, and comprises what was formerly three separate mines on the east side of the "contact" belt. On the Constitution and Mammoth are two parallel E. and W. veins, 2′ and 20′ wide. On the Cyane is a vein, 2′ to 3′ wide, coursing N.E. and S.W., and upon which is an 80′ shaft. Very little work has been done on them so far. P. Thautphaus, of San Francisco, owner.

Joseph Warren Mine (Quartz).—It is 1¼ miles N.E. from Nevada City, at 2,550′ elevation, and adjoins the Texas. The 3′ vein strikes E. and W., and dips 60° N. in granite. The mine is opened through shaft and tunnel; the former, 30′ deep, with a 20′ drift at the bottom; the latter, 150′ long, has not reached the vein. Two men are at work. J. & S. Jacobs and Erwin Treadwell, of Nevada City, owners.

Kirkham Mine (Quartz).—It is 2 miles N.W. from Nevada City, at 2,650′ elevation, and comprises 24.5 acres of patented ground. The vein has a N.E. course, with a W. dip, showing a 3′ vein in granite; the quartz contains about ½% of sulphurets. The developments are carried on through a 128′ cross-cut to the vein, on which 160′ have been drifted. A second tunnel, 112′ below, has been started. One man at work. T. P. Kirkham, of Nevada City, owner.

Knickerbocker Mine (Drift).—See our XIIth Report, p. 191. It is in Secs. 1 and 2, T. 16 N., R. 8 E., on Cement Hill, 1 mile N.W. from Nevada City, at 2,680′ elevation, and comprises 370 acres of ground. No systematic work is being done; a short prospect drift is being run from the main drift to the south on bedrock gravel, claimed to be a break from the main channel. Four men are at work. L. D. Craig et al., of San Francisco, owners.

La Belle Mine (Quartz).—It is 3¼ miles E. of Nevada City, at 2,625′ elevation. The vein strikes N. 72° 30′ W., and dips 30° N., crossing the contact with a vein 5″ to 2½′ wide. The quartz is said to carry 1% of iron, zinc, and lead sulphurets. The work consists of 128′ cross-cut to the vein and 250′ of drifts, one being 200′ E. and the other 56′ W., showing a 17″ vein in the face. This drift gives 600′ of backs on the slope of the vein. Only about 100 tons have been stoped. Water-power is available, and but little timbering required. The mine makes about 3 miner's inches of water. Five men are at work. J. J. Lyons and L. Postelwaite, of Nevada City, owners.

La Grande Mine (Quartz).—It is 5 miles N.E. from Washington, at 4,625′ elevation, and comprises two full claims. The vein, which has a very prominent outcrop, strikes N., dips E. in slate, and shows a width of 3′ on an average. Two shallow shafts, 30′ and 20′ deep, have been started on the outcrop, and a cross-cut, at present 60′ long, will require extending 200′ to reach the vein, 80′ below the shaft. Three men are at work. W. H. Meade, of Washington, owner.

La Marque Mine (Quartz).—It is 2 miles S. from Grass Valley, at 2,600′ elevation, and comprises 3,700′ by 600′. The vein strikes N. and S., and dips 18° W., between slate walls 10″ apart. The quartz carries high-grade sulphurets. The work is carried on through an incline 325′ deep, from the bottom of which drifts have been started both ways, being about 100′ in length. Ten men are employed. An incorporated company, of Grass Valley, owner; J. Mulroy, secretary; A. Maltman, of Grass Valley, superintendent.

Last Chance and Pinney Mine (Quartz).—It is 2 miles S. of Maybert, at 5,400′ elevation, and comprises two full claims. The vein strikes N., and dips 56° E.; it is narrow, but carries a high grade of rock. A crosscut has been driven 150′ to the vein. A small 5-stamp mill, with 750-lb. stamps, is driven by steam-power. Four men are at work. Parsons, West & Fowler, of Maybert, owners.

Lindsay Mine (Quartz).—It is 5 miles N.E. from Washington, at 5,400′ elevation, and comprises two claims with parallel veins, known as the *Big* and *Little Lindsay*. The 5′ vein strikes a little W. of N., and dips E., in protogene. The mine is being reopened through a tunnel that will strike the vein 200′ below all the old workings. Greathouse, Robertson & Bell, owners; — Tully, of Maybert, superintendent.

Live Oak and Minuet Mine (Quartz).—See our XIIth Report, p. 191. It is on Grizzly Ridge, 2½ miles N. from Columbia Hill, at about 2,600′ elevation. McMahon & Jennings, of Columbia Hill, owners.

Lone Ridge Mine (Quartz).—It is 5½ miles N.W. from Nevada City, at 2,800′ elevation. Of the three parallel veins striking N.E., the principal one dips 30° N.W., between slate and diorite walls, varying in width. The three veins dip toward each other, the foot-wall vein being the flattest. The quartz carries ochery material, and is said to mill high; the ore-shoots are narrow, not over 50′ across. There are two incline shafts, 50′ and 25′ deep, respectively, and a 30′ drift. The ore is reduced in an 8′ arrastra run by a hurdy wheel, under 80′ head, using free water from an old tunnel. Two men are at work. Kirkham Brothers, of Nevada City, owners.

Lone Star (*Murchie*) *Mine* (Quartz and Hydraulic).—It is 1½ miles E. from Nevada City, at 2,750′ elevation, and comprises 359 acres. There are two systems of veins on the property, striking N.-S. and E.-W.; the latter dip 65° N. and cross the former, which have a flat dip to the west. They are all in granite. The old works were chiefly on the *Big Blue* vein, which is the strongest vein in the group, but of low grade, the incline being 700′ long; some work was also done on the *Independence*, a N. and S. vein. The present works are on the *Coe* vein, south of the Big Blue, through a tunnel 800′ in length, which crosses the Big Blue. Belonging to the property is an 8-stamp mill on Deer Creek, ¼ mile distant, with 900-lb. stamps driven by a 6′ Pelton wheel, under 41′ pressure, with water from a ditch ¾ mile long, diverting 300 miner's inches from Deer Creek. The mill is idle. Five men are employed. An incorporated company, of San Francisco, owner; A. W. Blundell, of Nevada City, secretary and superintendent.

Lupine Mine (Drift).—See our XIIth Report, p. 191. It is 11 miles N.E. from Nevada City, in Sec. 21, T. 16 N., R. 9 E., at 3,800′ elevation, and comprises 320 acres. At present three men are drifting into the main ridge to strike the main channel. Judge Caldwell et al., of Nevada City, owners.

Malony & Fouch Mine (Quartz).—It is 6 miles S.E. from Graniteville, at 5,000′ elevation. The vein strikes N.E., and dips 45° E., in a slate formation, with a width of 8′ to 10′. It is in the nature of a porphyry, and it is said to carry 2½% of high-grade sulphurets. The developments consist of a tunnel 20′ long, giving 30′ of backs and 15′ wide at the breast. A 2-stamp prospecting mill has 110-lb. stamps, with a capacity of 1 ton per day, run by free water obtained from Poorman's Creek, through a ditch 1 mile long, with a capacity of 100 miner's inches, delivering the water under 200′ head. Two men are employed. C. Malony and — Fouch, of Graniteville, owners.

Mammoth Mine (Quartz).—See Jesse Consolidated.

Manhattan Mine (Quartz).—See Goodall Consolidated.

Manzanita Mine (Drift).—See our VIIIth, XIth, and XIIth Reports, pp. 458, 302, and 191. It is ½ mile N. of Nevada City, at 2,500′ elevation, and comprises 206 acres of patented ground. The company own two water-rights; the Manzanita ditch takes water from Slate Creek; and the Deer Creek ditch, with a capacity of 1,000 miner's inches, takes water from near Scott's Flat through 7 miles of ditch. Idle. Manzanita Gravel Mining Co., of Nevada City, owner; B. F. Snell, secretary; E. A. Tompkins, of Nevada City, superintendent.

Mary Jane Mine (Drift).—It is 10 miles N. of Emigrant Gap, at 5,975′ elevation, and comprises 100 acres on an ancient channel, supposed to be identical with the Omega. The main tunnel is 700′ long, and a 12′ upraise is made into the gravel; the gravel gangway is 230′ long, and the breasts are carried 5′ high and 40′ wide, and timbered with post and cap. Each man extracts 8 cars, of 1,200 lbs. each, daily. The gold is coarse. Wash-water is obtained from Boney Creek and dropped into a reservoir; the gravel is washed four times per day through a 12″ flume set on 6″ grade. Seven men are employed. — Hyatt, E. H. Whelan, et al., of Emigrant Gap, owners.

Maryland-Idaho Mine (Quartz).—See our VIth (Part II), VIIIth, Xth, XIth, and XIIth Reports, pp. 45, 425, 372, 271, and 192. It is about 1 mile N.E. from Grass Valley, at 2,525′ elevation. At present they are sinking a winze below the 1,600′ level, now 300′ deep, and erecting a compressed-air hoist on it; drifting has been started from the bottom. The 40-stamp mill is crushing 80 tons per day, and using 16 Frue and Triumph concentrators. Everything is driven with water-power, with an auxiliary steam plant in case of necessity. The entire plant is very complete. Electric lights are supplied at hoist, mill, and dump from a 60-light dynamo. The waste car is elevated to the waste-dump tracks, to economize room around the plant. One hundred and forty men are employed. An incorporated company, owner; S. P. Dorsey, of Grass Valley, manager.

Massachusetts Hill Mine (Quartz).—It is 1 mile S. from Grass Valley, at 2,375′ elevation, and comprises a number of former mines, including the *Boston Ravine*, *Great Britain*, *New Rocky Bar*, *New York Hill*, *Polkinghorn*, *Rocky Bar*, and *Stockbridge*. These properties will be worked as a unit. A 5′x 16′ three-compartment shaft is being sunk to strike the Breman shaft, which will be enlarged. On this shaft the largest size, double, Rix compound pneumatic hoist has been erected, with 10″ and 14″ Dow pumps with 3′ stroke. The power is obtained from the South Yuba ditch, and is conducted through 7,000′ of 30″ steel pipe to the power-house, situated on Boston Ravine, about 1,000′ from the shaft, where an 18½′ Pelton wheel has been placed, working under a head of 775′, equal to a pressure of 320 lbs. per square inch. The conduit which conveys the water is a continuous riveted pipe, made, at the point of greatest pressure, of No. 5 steel plate, without any allowance for contraction or expansion, capable of resisting any strain that may be brought upon it. The wheel is mounted on a 10″ shaft connecting direct with two compound air-compressors of 10″ and 18″ diameter and 24″ stroke. The air is compressed to 30 lbs., and is conducted through the wheel-pit into a cooler consisting of 50 copper pipes 18′ long and 1″ in diameter, whence it enters the second cylinder and is compressed to 90 lbs. and conducted to the receiver in the shaft-house, 820′ distant, through a 6″ pipe, with practically no loss. The air is then raised to a temperature of about 350° by passing it through pipes placed in a furnace so arranged that it has to pass over the heated surface, the volume being increased about 43%. For hoisting purposes it passes into the high-pressure cylinder of a direct-acting Corliss engine, after leaving which it passes through a second reheater, and is passed to the low-pressure cylinder of the engine, from which it exhausts into a brick flue that conveys it to the miners' changing-rooms, where it is liberated. The air for the pumps, after reheating, is sent down the shaft through a pipe covered with a non-conductor. The water for power costs 1 cent per 1,000 gals. For a full description of this plant see special article in the back part of this volume. There is a steam plant which can be quickly put in use in case of accident to the water or air plant. Besides the main working shaft, two drain-tunnels are being driven to cut off the surface water. Large and convenient repair shops, offices, and changing-rooms for the men have been erected. The entire works will be lighted by electricity, a dynamo for the purpose being placed in the power-house. Forty men are employed at present. An incorporated company, of New York, owner; A. DeWint Foote, of Grass Valley, superintendent.

Mayflower Mine (Quartz and Hydraulic).—See our VIIIth, XIth, and XIIth Reports, pp. 453, 295, and 192. It is on Little Deer Creek, 2 miles S.E. from Nevada City, at 2,850′ elevation, and comprises 186 acres. Since our last Report the property has changed hands, and is being worked on a much more extensive scale than heretofore. Of the different veins included in the property, the *Beckman* and *Mayflower* are receiving the principal developments. The former is an E. and W. vein, averaging 18″ in width, with a dip of 25° S. between slate walls, following the foldings of the slate. A new 6½′x 14′ incline has been sunk 400′ (on the slope) to the east of the old workings, and a considerable number of drifts have been run, connecting on the west with the former workings, opening up new stoping ground. This incline is provided with double-reel hoist, each drum worked independently by two 8′ Pelton wheels, with 3 nozzles, the gates being operated by hydraulic engines. The pressure is 290′, taking water from South Yuba Ditch Co., through 1,200′ of pipe. The pay-shoot on the Beckman vein has been opened for a continuous length of 1,700′, of which 1,300′ is W. of the shaft and 400′ to the E., where it still continues. The ore from this shoot is stated to carry 3½% of sulphurets of medium grade, consisting of galena, zinc-blende, iron sulphides, and some telluride. The Mayflower vein lies in grano-diorite, between two bodies of slate, and above the Beckman vein. It has been intruded and thrown by a large quartz dike. The Mayflower pay-shoot shows a length of 250′ on one side of the dike and 400′ on the other side, where it still shows in the face. Over 1,500′ of drifts have been run on this vein. The quartz is distinct in its character from the Beckman quartz, carrying fewer sulphurets, and being permeated with chlorite. The former owners took, it is said, extremely high-grade ore from this vein. A drain-tunnel, 700′ long, taps the works 215′ below the surface, measuring on the slope, and discharges into Little Deer Creek. Below this level the works are drained by an ejector. A new 20-stamp mill, with 900-lb. stamps, steel cams and shoes, and iron dies, is run by water-power, at 96 drops per minute with 5″ drop and 7″ discharge, through No. 1 tin screens. There are front and back plates in the mortars, and in place of aprons, a double line of 2′ plates, 12′ long, set on a 2″ to 1′ grade. There are also 8 Frue concentrators. The ore is passed through the rock-breaker at the shaft before being delivered to the 250-ton ore-bin in the mill. The capacity of the mill is 40 to 45 tons per day, producing 1,500 lbs. of concentrates per day. A compressor in the mill-building runs 5 Burleigh drills, 3 of which only are in use at present. The works are lighted by electricity. The hydraulic ground belonging to the property is not being worked. Fifty-five men are employed. An incorporated company, of No. 532 Market Street, San Francisco, owner; E. A. Davis, of Nevada City, superintendent.

Merrimac Mine (Quartz).—See our XIth Report, p. 279. It is in T. 10, R. 8 E., 2 miles N.E. of Grass Valley. Idle. An incorporated company, of San Francisco, owner.

Metropolitan Mine (Quartz).—It is 1 mile N. of Moore's Flat, at 3,800′ elevation, and comprises 3,000′ by 600′. The 4′ vein strikes N.W. and S.E., and dips 65° S.W., in a greenstone formation. There are three tunnels running on the vein. No. 1 is 107′, No. 2, 1,040′, and No. 3, 250′ long, with 71′ distance between each of them. Cañons on each side of the claim will furnish free water-power. The ore carries arsenical pyrites, though not of a high grade, but occasional rich pockets are met with.

Mineral King Mine (Quartz).—It is 1¼ miles in a N.E. direction from Nevada City, at 2,550′ elevation. The vein strikes E. and W., and dips N., in granite. It adjoins the Texas Mine on the east, and is parallel with the Joseph Warren Mine. It is opened by an 80′ shaft, which will connect with a tunnel from the Joseph Warren Mine. Idle. —- Jacobs and Erwin Treadwell, of Nevada City, owners.

Mistletoe Mine (Quartz).—See our XIIth Report, p. 193. It is 1 mile N.W. of Rough and Ready, at 1,780′ elevation. The 4½′ vein strikes S. 70° E. and dips 60° N.E. between grano-diorite walls. A 5′x 12′ incline shaft, 60′ deep, is tapped by a drain-tunnel 15′ from the surface. Short drifts have been started. The hoist and pumps are run by steam. Two men are employed. C. J. Graham et al., of Rough and Ready, owners.

Mohican Mine (Quartz).—It is 1½ miles S. of Nevada City, at 2,700′ elevation, and comprises two claims, designated the *Gold Flat* and *Mohican*. The vein strikes E. and W., and dips S., from 3′ to 6′ wide, between slate walls. The 4′x 8′ main incline is sunk 150′ on a 36° grade, with levels turned off at 140′; they extend 90′ W. and 80′ E. On the Gold Flat claim is a shaft known as the Mulberry shaft, 100′ deep, sunk 350′ from east end of the claim, with drifts run from the 80′ level for a distance of 50′, showing a 2′ vein in the breast, well mineralized. Idle. An incorporated company, of Grass Valley, owner; J. Skewes, of Grass Valley, superintendent.

Monarch and Central Pacific Mine (Quartz).—See our XIIth Report, p. 193. It is 1 mile N. from Rough and Ready, at 1,875′ elevation. The 4′ vein strikes N.W., and dips N.E., in syenite. A 4′x 8′ perpendicular shaft is 57′ deep; 30′ feet below the surface is a drift 35′ long. There is a 10 H.P. steam hoist with a 4″ plunger pump. The Central Pacific has a 37′ vertical shaft on a parallel vein, dipping toward the latter, and said to carry 10% of sulphurets of high grade; this portion of the property is idle. Three men are employed. An incorporated company, of Oakland, owner; J. Lyons, of Rough and Ready, superintendent.

Montana Mine (Quartz).—It is 3 miles S. from Nevada City, at 3,000′ elevation. The vein strikes N.E., and dips 20° N.W. on the slate and granite contact. A double-compartment shaft, 300′ deep, shows three quartz stringers in the hanging-wall, 2″, 4″, and 10″ wide, said to carry high-grade sulphurets. A pay-shoot shows on the surface, 200′ from the shaft. The hoist and pump are driven by steam-power. Idle. J. Garner, of Nevada City, owner.

Montreal Mine (Quartz).—See Caledonia.

Mount Auburn Mine (Quartz).—It is 1½ miles W. from Nevada City, at 2,750′ elevation, and comprises 3,000′ by 600′. The vein strikes N. and S., dips 45° E., in granite, and is from 2′ to 5′ wide, with about 1% sulphurets. The 10-stamp mill and hoist have been removed. Idle. T. Snell, of New York, and — White, of Grass Valley, owners.

Mount George Mine (Quartz).—See our XIIth Report, p. 193. It is 3 miles W. from Nevada City, at 2,800′ elevation, and comprises three claims. Since our last Report new water-power hoisting works have been erected, and the main shaft sunk to the 200′ level, whence a drift extends 400′ N., showing from 3′ to 4′ of a vein with 300′ of a pay-shoot of low-grade ore. The small, rich seam back of the main vein has been followed, with continued good yield. The water-power is obtained from the Excelsior ditch and is applied, under 85′ pressure, to three Pelton wheels, 5′, 4′, and 14″ in diameter. The 4″ Cornish pump has a 4′ stroke, and makes 6 strokes per minute. There is an arrastra for reducing the ore from the rich seam. Six men are employed. F. Zeitler, of Nevada City, and Hon. J. F. Kidder, of Grass Valley, owners.

Mountaineer Mine (Quartz).—See our Xth, XIth, and XIIth Reports, pp. 384, 287, and 193. It is 1 mile W. from Nevada City, at 2,325′ elevation, and comprises 80 acres S. of Deer Creek, besides 1,500′ by 60′ on the N., where the works are situated. The *Mountaineer* vein strikes N.E. and dips S.E., with 18″ average width between granite walls. About 150′ E. is a second vein, the *Black Prince*, with similar course and dip and 2′ wide, but of lower grade. On the north side of Deer Creek a drain tunnel, 1,700′ long, follows the Mountaineer vein, and, when in 1,000′, taps the main shaft at a depth of 500′ from the surface. This shaft is a 6′x 12′ incline over 800′ deep, with stations at every 100′ down to the 700′ level; the eighth level is 150′ below. There is a 10″ Cornish plunger pump at the 300′ level, run by a 5′ Pelton wheel, under 312′ pressure. The vein makes in rolls on the foot-wall, throwing off small veins into the hanging-wall, besides showing two separate quartz bodies on the foot and hanging walls, with intervening bodies of granite. At the 100′ level N. of the shaft the vein takes a sudden turn to the W. for about 60′, then curves back to its original course; this curvature is seen again at the 300′ and 800′ levels; on the latter it starts 700′ from the shaft. On the 400′ level, S. of the shaft, a quartz feeder makes over from the Mountaineer to the Black Prince. Four ore-shoots have been stoped, the longest being 200′; generally they are comparatively short; they carry iron and lead sulphurets, and on one shoot some telluride. The shaft is being extended another 100′. But little timbering is required. South of the creek a tunnel has been driven on the Black

Prince, and two tunnels and an upraise on the Mountaineer vein, but the ore was found to be low grade. The water-power mill has 15 stamps, with frame for 20, and 10 only are dropping, on tributers' rock; there are also 6 Frue vanners, 4 of which are running. The ore is said to carry 1½% of sulphurets. The water is obtained from the South Yuba Ditch Co., through ½ mile of pipe, under 312′ pressure. Thirty men are employed. An incorporated company, of San José, owner; W. A. Dennis, of Nevada City, superintendent.

Mountain View Mine (Quartz).—It is on Cañon Creek, 7 miles E. of Washington, at 4,000′ elevation, and comprises 3,000′ by 600′. The vein strikes N. and S., and dips 50° E., and is from 2′ to 4′ wide, between granite walls. The quartz is said to carry 1% of good grade sulphurets. The developments comprise a 150′ tunnel on the vein, with an 85′ upraise to the surface, and a 20′ winze below the tunnel, showing the vein 1′ wide. There is a 3-stamp water-power mill with 1,000-lb. stamps, run at 96 drops of 6″, with 6½″ discharge through No. 40 screens, and crushing 2½ tons daily per stamp. The water-power is derived from Cañon Creek, through a short ditch of 250 miner's inches capacity, delivered on a 5′ Pelton wheel under 33′ pressure, using 140 miner's inches. The property is idle. C. O. Anderson et al., of Nevada City, owners.

Mount Vernon Mine (Quartz).—See Oro Grande.

Müller & Walling Mine (Quartz).—See our XIth and XIIth Reports, pp. 296 and 194. It is in Woods Ravine, 1¼ miles W. of Nevada City, at 2,600′ elevation, and comprises 2,100′ on the lode line, with irregular side lines. Idle. Müller & Walling, of Nevada City, owners.

Murchie Mine (Quartz and Hydraulic).—See Lone Star.

Murphy & Grover (Hirschman) Mine (Drift).—It is ¾ mile N.W. from Nevada City, at 2,642′ elevation, comprising the former Hirschman hydraulic mine. A bedrock tünnel is being driven N. into a spill from the main channel coming down the Harmony ridge; it is 1,000′ in length, with side drifts. Three men are doing assessment work. Murphy & Grover, of Nevada City, owners.

National Gold Mining Co.'s Mine (Quartz).—See our XIth and XIIth Reports, pp. 309 and 194. It is 1½ miles S.E. from Graniteville, at 4,575′ elevation, and comprises two claims. Since our last Report, the incline has been sunk 70′ deeper, or to 180′, and the south drift has been extended 400′, showing a 4′ vein. Between the 100′ and the 170′ levels some stoping has been done, and some cross-cutting is being done in the lower level. The capacity of the mill has been increased by the addition of 5 stamps, of 750 lbs. weight, to the former Huntington mill, making the capacity now 22 tons per day. A Rix compressor, for one Ingersoll drill, and a Worthington pump have also been added to the plant. During the winter 3 men, and in summer 15 men are employed. Mrs. McKillican, of North Bloomfield, owner.

Nevada City Mine (Quartz).—See Gold Hill.

Nevada County Reduction Works.—They are 1½ miles E. of Grass Valley, and used chiefly for chlorinating the concentrates from the Nevada County mines. The plant, which is very complete, is prepared to handle 4 tons per day. One thousand tons of concentrates were treated in 1894, and 800 tons in 1895. At present the works are idle. A. Maltman and S. C. Thompson, of Grass Valley, owners; A. Maltman, of Grass Valley, manager.

Neversweat Mine (Quartz).—It is 3 miles N.E. from Nevada City, at 3,125′ elevation, and comprises two claims, 1,500′ by 600′ and 1,000′ by 600′. The vein strikes E. and W., and dips 45° N., to a depth of 200′, when it changes to a southerly dip. It lies mostly in the granite, close to the contact, is from 3″ to 2′ wide, and carries heavily mineralized ore. A tunnel driven 1,600′ on the vein connects near the end with an incline 300′ deep from the surface. A 50′ winze has been sunk below the tunnel level. For about 200′ in length, the ground above the level has been stoped to the surface. An incline, 500′ E. of the main works, and 200′ higher, and pitching S.E., has been sunk 65′, and a drift has been started. Four men are employed. J. Lyons, of Nevada City, owner.

New Idea Mine (Quartz).—See Syndicate.

New Pittsburg Mine (Quartz).—See our XIth and XIIth Reports, pp. 294 and 197. It is 1½ miles S. from Nevada City, at 2,780′ elevation, and comprises 4,500′ by 600′. The vein, 1′ to 3½′ wide, strikes N. 12° E., and dips 45° E., in diabase. The quartz is a ribbon rock, heavily mineralized, and said to carry 5% of sulphurets. The mine is at present worked by tributers, most of the ore-supply coming from between the 400′ and 500′ levels. A winze is being sunk between the fifth and sixth levels, and the level on the 500′ is being pushed ahead. The 10-stamp mill runs intermittently. The power for both mill and hoist is water, requiring 60 miner's inches under 280′ and 295′ pressure, but auxiliary steam is provided for hoisting and pumping. Fifteen men are employed. An incorporated company, of No. 61 Front Street, San Francisco, owner; — Neilson, secretary; T. J. Furbee, of Grass Valley, superintendent.

New Providence Mine (Quartz).—It is on the Blue Tent road, 4 miles N. of Nevada City, at 2,800′ elevation, and comprises 3,000′ by 600′. The 2′ vein strikes N.E., and dips 80° N., in granite, and is said to contain 5% of high-grade sulphurets. The mine is opened through a 4′x 6′ incline 55′ deep, with short drifts on both sides, exposing in the breast 18″ and 24″ of quartz. A second shaft, started on a feeder, is 15′ deep, showing 5″ of quartz. Two men are at work. E. D. Dean et al., of Nevada City, owners.

New Rocky Bar Mine (Quartz).—See Massachusetts Hill.

New York Mine (Quartz).—See Union.

New York Hill Mine (Quartz).—See Massachusetts Hill.

Niagara Mine (Quartz).—It is 1 mile E. from Nevada City, at 2,600′ elevation. The vein strikes E. and W., and dips 80° N., with a width of 2′ between granite walls; the quartz being heavily mineralized. There are two 4′x 6′ inclines, 80′ and 40′ deep respectively, with 4″ ejector for removing the water. Ten inches of water for power are procured from the Manzanita ditch, through 1,000′ of 7″ pipe, under 150′ pressure. Two men are employed. A. Durbin et al., of Nevada City, owners.

Norambagua (*Forest Springs Quartz Mining and Lumber Co.'s*) *Mine* (Quartz).—It is 3¾ miles S. of Grass Valley, at 2,100′ elevation, and comprises 4,000′ by 600′. The vein strikes N. and S., and dips 20° E. The old workings on the property, 600′ deep, are abandoned; the present workings are carried on through a drain tunnel, 1,700′ long, running E. into the hill until it reaches the vein, when it turns 300′ N. and 500′ S. toward the old shaft, showing the vein to average 8′ in width. From the drain tunnel to the outcrop are 500′ of backs. The quartz carries arsenical and iron pyrites. Twenty-one tributers are at work. W. Campbell, of Grass Valley, owner.

Normandy Mine (Quartz).—It is in Secs. 31 and 32, T. 16 N., R. 8 E., and 4 miles S.W. of Grass Valley, at 2,250′ elevation. There are two parallel veins, 12″ and 18″ wide and 50′ apart on the surface, running N. and S., and dipping 35° W. and 65° W., in slate; the latter being the foot-wall vein. On the hanging-wall vein is an incline 118′ deep. From the shaft, drifts have been run 100′ N. and 30′ S., at which point a cross-cut is being run for the foot-wall vein; it is 20′ long at present. Idle. J. Richards and F. Dulman, of Grass Valley, owners.

North Banner Consolidated Tunnel Co.'s Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 420 and 194. It is 3½ miles S.E. of Nevada City, at 3,200′ elevation, and comprises five claims. Since our last Report the mine has changed owners, and is now being pumped out; 170′ of water being in the mine in August, 1896. Seven men are employed. An incorporated company, of San Francisco, owner; G. Mainhart, of Grass Valley, superintendent.

North Bloomfield Mine (Hydraulic).—See our VIIIth, IXth, and XIIth Reports, pp. 454, 122, and 195. It is situated at the town of North Bloomfield, at 3,000′ elevation, and employs thirty-five men hydraulicking behind restraining dams. North Bloomfield Gravel Co., of San Francisco, owner; L. L. Myers, of North Bloomfield, superintendent.

North San Juan Quartz Mining Co.'s (Boss) Mine (Quartz).—It is 1½ miles W. of Sebastopol, and comprises two claims. The south vein strikes N., and dips 75° E., carrying 5′ of quartz, between slate walls. A 6′x 8′ vertical shaft has been sunk 200′, and drifts run at the 50′, 70′, and 100′ levels, both N. and S.; on the south side, the ground from the 70′ level to the surface has been stoped. One half mile from the shaft is a 5′ Huntington mill, which crushes 25 tons per day. The power for hoist and mill is steam. Idle. An incorporated company, of San Francisco, owner; H. W. Morris, of No. 141 First Street, San Francisco, secretary.

North Star Mine (Quartz).—See our VIth (Part II), VIIIth, Xth, XIth, and XIIth Reports, pp. 44, 428, 376, 270, and 195. It is 2 miles S. from Grass Valley, at 2,470′ elevation, and comprises 800′ by 3,300′. The main working shaft has a depth of 2,400′ on the dip, with 23 levels, extending 900′ W. and 1,400′ E. The present supply of rock for the mill is taken from different points between the 500′ and the 2,300′ levels. One hundred and thirty men are employed underground and twelve on the surface. P. C. Roberts, of Grass Valley, superintendent.

North Star Mine (Quartz).—It is on Cañon Creek, 5 miles N.E. from Washington, at 4,600′ elevation, and comprises two patented claims, one on each side of the creek. The vein strikes N. and S., dips 75° E., and shows a 6′ ledge, with slate casing in granite formation. There is a 200′ tunnel on the vein. Idle. H. Kohler, of Washington, owner.

Norway Mine (Quartz).—It is in God's Country Ravine, 7 miles N.E. from Washington, at 4,500′ elevation. The 1′ wide vein strikes N. and S., dips 65° E., in protogene. There are four tunnels on the veins, the longest being 160′, and most of the ground to the surface stoped. Two men are at work. Marcot & Nelson, of Washington, owners.

Odin Mine (Drift).—See our XIth and XIIth Reports, pp. 301 and 196. It is 1¼ miles N. of Nevada City. Idle. An incorporated company, of Nevada City, owner.

Ogdensburg Mine (Drift).—See Fisk.

Old Home Mine (Quartz).—It is 5½ miles N.W. of Nevada City, at 2,940′ elevation, and comprises one claim, formerly a part of the Mount Vernon Mine. The 16″ vein strikes N.E., and dips 30° N.W., between greenstone and grano-diorite walls. The quartz is heavily mineralized below water-level, and the sulphurets are said to be high-grade. A 4′x 5′ incline has been sunk 50′ and about 200′ of drifts run from it, and the ground stoped to the surface. Three ore-shoots have been cut. Two men are at work. Kirkham Bros., of Nevada City, owners.

Omaha and Lone Jack Consolidated Mine (Quartz).—See our VIIIth, Xth, XIth, and XIIth Reports, pp. 433, 373, 273, and 197. It is 1½ miles S. of Grass Valley, at 2,500′ elevation, and comprises 2,400′ on the lode line. The vein strikes N. and S., and dips 32° W., with an average width of 12″, in a slate formation near the contact with syenite. Since our last Report 200′ have been sunk, making seventeen stations in all; also 2,000′ of drifts run, mostly south. Most of the ore at present comes from the seventh level. Fifteen out of twenty-five of the 800-lb. stamps in the water-power mill are running. There are four improved belt Frue vanners. Twenty-eight men are employed. An incorporated company, of Grass Valley, owner; G. Mainhart, of Grass Valley, superintendent.

Omega Mine (Hydraulic).—It is 3 miles E. of Washington. The company has leased ten claims to Chinese, but work was stopped on account of the restraining dam washing out. An incorporated company, of San Francisco, owner.

Ophir Mine (Quartz).—See Empire.

Oregon (*Kate Hayes Hill*) *Mine* (Quartz).—It is in South Grass Valley, at 2,550′ elevation. The vein courses N. and S., and dips 45′ W., between diorite and diabase, and is 1′ and 2′ wide, carrying 1½% of sulphurets. A double-compartment incline is 285′ deep, with three levels, extending about 150′ both N. and S., except the bottom level, which is 60′ N. and 140′ S. A drain tunnel, 800′ long, cuts the shaft at 120′; it is run in on the vein, and the ground along the pay-shoot, 200′ long, is stoped to the surface. No hoisting works. At present idle, but will resume shortly, when hoisting works will be erected. G. Mainhart, J. Burke, J. Fillmore et al., of Grass Valley, owners.

Original Empire (*Ophir*) *Mine* (Quartz).—See our VIIIth, XIth, and XIIth Reports, pp. 426, 273, and 189. It is 1½ miles S.E. from Grass Valley, at 2,650′ elevation, and comprises six claims. The principal workings at present are north of the shaft, between the 2,000′ and 2,100′ levels. A large number of tributers are employed. The 40-stamp water-power mill receives water from the Grass Valley Water-Power Co., under 440′ head at the mill and 430′ at the hoist. There are in all five Pelton wheels, besides an auxiliary steam-engine for pumps in case of accidents. The compressor has a capacity of six drills, but only two are running. The mine produces 42 tons of sulphurets per month, which are sold. From 125 to 130 men are employed; 60 on day's pay, the remainder on contract and tribute work. An incorporated company, of Grass Valley, owner; P. Walker, of Grass Valley, superintendent.

Orleans Mine (Quartz).—It is between Osborne and Ophir Hills, 1¼ miles S.E. from Grass Valley, at 2,700′ elevation, and comprises 85 acres of patented ground. The 6″ vein strikes N. and S., and dips 34° to 43° W., in diorite. The 6′x 9′ double-compartment incline shaft is

535′ deep, and is being driven ahead. Some tributers are taking ore from stopes between the third and fourth levels. The water-power hoist uses a 6′ Pelton wheel, under 441′ pressure. The nozzles are provided with the Chavanne patent regulator. The pumping plant consists of two 8″ Cornish plungers, making five 4′ strokes per minute, and are driven by steam-power. The 5-stamp mill, with 850-lb. stamps, is run at 95 drops per minute, with 6″ drop and 4½″ discharge, using No. 40 brass wire screens, and crushing 1⅝ tons per stamp. The screens are put on somewhat differently from the usual method. Each section of screen is drawn tight over a wooden frame made to fit snugly into the divisions of the screen-frame, and when so placed is retained in its position by an iron strap fastened in front. This is done to permit of readily reversing each section in case the lower part is ruptured, without having to put in an entire new screen. The apron-plates are set on a grade of 1½″ to the foot and dressed with lime, applied with chamois skin. A Hendy-Norbaum concentrator handles the 3% of concentrates, saving, it is claimed, an especially fine grade of slimed sulphurets that float on the water. The mill is run by a 6′ Pelton wheel, under 441′ pressure, with water obtained from the Empire reservoir through 1,400′ of 8″ to 6″ pipe. Nine men are employed. An incorporated company, of No. 101 Sansome Street, San Francisco, owner; W. Olney, Jr., secretary; C. A. Brockington, of Grass Valley, superintendent.

Orleans Mine (Quartz).—It is opposite the Red Hill Mine, 2 miles W. from Nevada City, at 2,400′ elevation. The narrow vein strikes N.W., with the dip, near the granite contact, varying from nearly vertical to 50° E. A drift 600′ long is being driven ahead by two men. C. Brockington et al., of Grass Valley, owners; J. Richards, of Grass Valley, superintendent.

Oro Fino Mine (Quartz).—It is situated below the dam at Meadow Lake, at 7,300′ elevation, and is an extension of the old California vein, which strikes E. and W. and dips S. The very heavy outcrop is 40′ wide in places. On the property is a 4-stamp mill and a Frue concentrator, run by water obtained from the lake. Assessment work only. F. Cook and J. P. Clark, of Cisco, owners.

Oro Fino Mine (Quartz).—See Goodall Consolidated.

Oro Fino Mine (Quartz).—See Stanford.

Oro Grande (*Mount Vernon*) *Mine* (Quartz).—It is 5½ miles N.W. of Nevada City, at 2,875′ elevation. The vein strikes N., and dips 80° E., between slate walls. Along the surface five parallel outcrops can be traced inside of 50′, undoubtedly uniting as they go down. The present working is chiefly confined to opening up the old Mount Vernon works, through an 800′ tunnel on the north end, which intersects the old incline within a short distance of the bottom; it fails to drain the entire old works. A new patent mill, with a Dodge rock-breaker, is in course of erection. (Since our visit in December, 1895, the mill was tried and rejected.) Nine men are employed. An incorporated company, of No. 596 First Street, San Francisco, owner; C. W. Weld, secretary; S. T. Murchie, of Nevada City, superintendent.

Osborne Hill Mine (Quartz).—See our XIIth Report, p. 198. It is 3 miles S.E. from Grass Valley, at 2,800′ elevation, and comprises two claims. Idle. An incorporated company, of San Francisco, owner.

Osceola Mine (Quartz).—It is 1 mile S. of Rough and Ready, at 2,750′ elevation. Idle. Bert Moody et al., of Gold Run, Placer County, owner.

Pacific Mine (Quartz).—See Diamond.

Peabody Mine (Quartz).—See our XIIth Report, p. 198. It is in the town of Grass Valley. J. H. von Schroder et al., of Grass Valley, owners.

Pennsylvania Mine (Quartz).—See our Xth, XIth, and XIIth Reports, pp. 383, 276, and 198. It is in T. 16 N., R. 8 E., 1½ miles from Grass Valley. Idle. Pennsylvania Consolidated Gold Mining Co., of Grass Valley, owner.

Perseverance Mine (Drift).—It is 10 miles N.W. of Emigrant Gap, at 5,500′ elevation, and comprises 3,000′ along the course of an ancient channel on Fall Creek. A bedrock tunnel has just been started, which is expected to reach the channel in 300′. The gravel carries coarse gold and rests on granite bedrock. One man is at work. N. S. Douglas and J. Mattingly, of Emigrant Gap, owners.

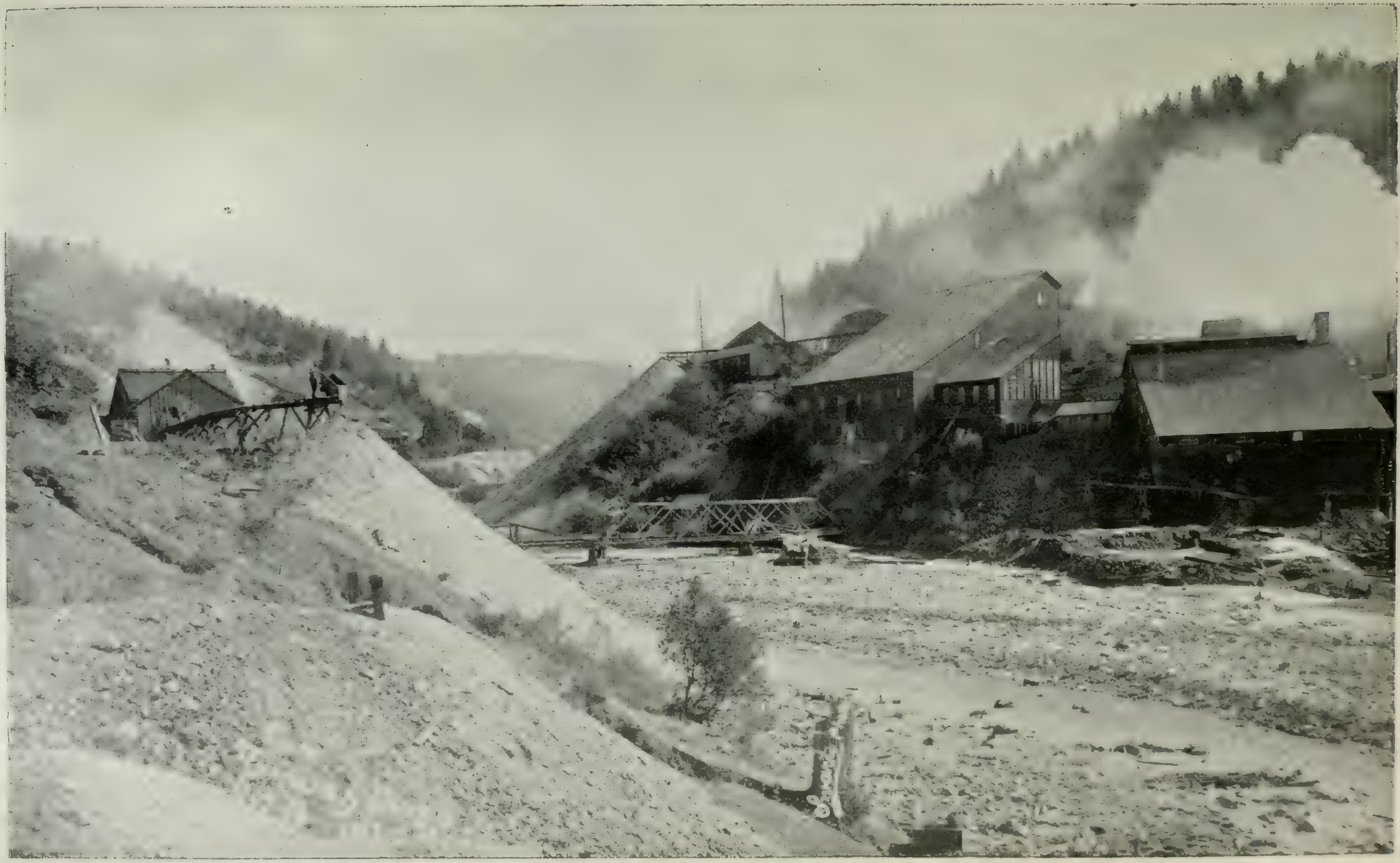
Pioneer Reduction Works.—They are situated ¾ mile S. of Nevada City. The works comprise a chlorination plant, a matte furnace, and a Tustin pulverizer, of 6-ton capacity, driven by 40 H.P. engine. For the matte, a reverberatory furnace, 9½′x 14′ inside measurement, is used, with a sand hearth 3½′ thick, burning petroleum with superheated steam. The petroleum is introduced through a flat burner, together with the steam. A charge in the furnace consists of 2 tons of green ore mixed with the tailings from the chlorination process that still contain some gold. From 12 to 15 tons are treated per day, requiring 600 gallons of petroleum per twenty-four hours, which equals in effect 11 cords of wood. (130 gallons is equivalent to 1 ton of coal.) Ten tons of the charged material yields 1 ton of the matte, carrying from 15% to 20% of copper. A ton of matte is produced per day. The stack for the matte furnace is 60′ high, 3½′ inside measure. The chlorination plant has a 4-ton furnace. Twelve men are employed. An incorporated company, of Nevada City, owner; J. H. English, secretary; B. Hall, of Nevada City, superintendent.

Polkinghorn Mine (Quartz).—See Massachusetts Hill.

Potosi Mine (Quartz).—See Gold Flat.

Providence Mine (Quartz).—See our VIth (Part II), VIIIth, XIth, and XIIth Reports, pp. 47, 418, 290, and 198. It is 1 mile W. of Nevada City, at 2,275′ elevation, and comprises 180 acres, or nearly 5,000′ on the lode line. Since our last Report the main incline has been extended from the 1,550′ to the 1,780′ level, and the veins, both back and front, developed for a distance of 700′ S.; also, 550′ of a cross-cut and several lateral drifts, amounting to 175′ in length, have been driven, and an upraise of 205′ made. During the past sixteen months over 3,000′ of drifting has been done. Pay-shoots have been opened on the lower as well as on the 1,500′ and 1,250′ levels. On the back, or so-called "slate vein," the walls are in rolls, and the pay-ore is lenticular and overlapping, pitching south. The ore on the shoots is stated to carry 5% of sulphurets, and on the back vein some handsome specimens of telluride are found. Water-power is used throughout the entire works, and obtained from the South Yuba Ditch Co., requiring 140 miner's inches, which is piped across Deer Creek. One hundred and four men are employed, of whom 78 are miners. Providence Gold Mining Co., of San Francisco, owner; W. McKinley, of Nevada City, superintendent.

Ragon Mine (Quartz and Drift).—It is 3 miles W. of Nevada City, at 2,700′ elevation, and comprises 80 acres. The gravel channel has a



Providence Mine, Mill, and Furnace.

westerly course, the main pay-channel being about 100′ wide, with a pipe-clay capping 70′ deep. The gravel carries large granite and quartz bowlders and scaly gold. The ground is worked through a 5′x 6′ double-compartment incline, 240′ long, giving 70′ perpendicular depth, and furnished with a hoist and Cornish bucket pump, run by 25 inches of water, applied to 5′ and 8′ Pelton wheels, under 58′ pressure, from the South Yuba Ditch Co. The main bedrock gangway is 170′ long and connects with the channel through a 15′ upraise. The breasts are carried 5′ high, and two shifts of four breasters each take out 50 carloads, of 1,400 lbs. each, per shift, and said to be worth $1 per car. The mine is ventilated through connection with old drifts. The surface of the ground is said to have paid well in early days for washing. The gravel-dump holds 100 cars, and empties through 12 boxes, 14″x 16″, supplied with slat riffles; the first ones are cleaned up every day. The waste-water from the wheels and the mine is use dfor washing. The tailings are retained and worked a second time. A quartz lead, from 2′ to 4′ wide, with a N.W. strike, has been followed down through the gravel, and is said to yield good results. Eighteen men are employed. G. Ragon, of Nevada City, owner; — Jacobs, of Nevada City, superintendent.

Rainbow Gold Mine (Quartz).—See our XIIth Report, p. 199. It is 5 miles S.E. from Eureka, at 5,500′ elevation. The 20″ vein strikes N.W., and dips 50° E., in granite. Idle. McBean & Meade, of Washington, owners.

Redan Mine (Quartz).—See Electrical Mining Co.

Red Dog Mining Co.'s Mine (Drift).—It is 1 mile N. from You Bet, at 2,910′ elevation, and comprises 200 acres on the Blue Lead channel. At present a 200′ incline shaft is being sunk to reach bedrock, and is 50′ deep now. The hoist is run by water-power from a 5′ Knight wheel, taking water, through Old Chalk Bluff ditch, from the head of Deer Creek. Ten men are at work. An incorporated company, of You Bet, owner; F. Goding, of You Bet, superintendent.

Red Hill Mine (Quartz).—It is 2 miles W. of Nevada City, at 2,550′ elevation, and comprises 48 acres on the north bank of Deer Creek. The surface has been formerly hydraulicked and has yielded many rich pockets in ochery seams of quartz traversing the bedrock. The general trend of the seams is N.W., with a dip of about 24° E. Where the present works are, the formation is clay, about 1,000′ wide, showing a former slate structure, situated to the west of the granite, between it and the slate, and traversed by a wide, hard dike of metamorphic silicious schist (Lindgren). A shaft has been sunk 60′ and drifts run, following a narrow, rich seam of ochre and quartz. An open cut has been carried up, following the same seam at about 60′ distant. This cut is over 400′ in length and 40′ deep, and will ultimately reach a length of 700′ and a depth of 70′. Much of the red clay itself will pay to mill. A Griffin mill, to be driven by electric power, is in course of erection. Eight men are employed. Red Hill Gravel Mining Co. (Ltd.), of Scotland, owner; G. Treadwell, of Nevada City, superintendent.

Red Hill Specimen Mine (Quartz).—It is 1¼ miles W. of Nevada City (adjoining the above), at 2,650′ elevation, and comprises 2,650′. The vein strikes E. of N., dips S., and is from 4″ to 6″ wide in a clay formation between the granite and slate. A series of shallow (10′) shafts have been sunk for prospecting purposes, and a 40′ shaft sunk to cut the main vein about 15′ yet below. Two men are at work. A. Muller, of Nevada City, owner.

Red Point Mine (Quartz).—It is ½ mile N.W. from Washington, across the Yuba River, at 2,650′ elevation. The formation is an altered rock in the vicinity of the slate and serpentine contact, in which there is a gold-bearing fissure striking W. of N., nearly vertical, with no quartz. Surface work and an 80′ tunnel comprise the development. Two men are at work. W. E. Yeaw and E. A. Langford, of Washington, owners.

Reward Mine (Quartz).—See our XIIth Report, p. 199. It is 1 mile S.W. from Nevada City, at 2,600′ elevation, and comprises two full claims east of the Providence Mine. The 16″ vein strikes N. and S., and dips 36° E., in grano-diorite. On the pay-shoot, which pitches apparently north, the quartz is said to contain 5% of sulphurets of high grade. The better portion of the sulphuret ore is hand-sorted, sacked, and shipped. The 5′x 8′ double-compartment main shaft is 400′ deep, and supplied with hoist and pumps driven by steam furnished from a 60 H.P. boiler. The pumps consist of an 8″ plunger and a 6′ lift. A second temporary 5′x 6′ shaft has been sunk to a depth of 300′, with a 15 H.P. steam hoist, to tap the drain tunnel of the California Mine adjoining, from which point a drift has been run 600′ N., where an upraise is being made to connect with the bottom of the main shaft. This drift, which, in connection with the California's adit, will serve as a drain tunnel, shows a continuous vein with a pay-shoot of high-grade ore 250′ long. No work is being or will be done from the main shaft at present, until connection is made through the upraise, when drainage and ventilation for this part of the mine will be secured. No ore is crushed at present. An incorporated company, care of Union League Club, San Francisco, owner; S. W. Backus, secretary; J. T. Gribble, of Nevada City, superintendent.

Rising Sun Mine (Quartz).—It is 5 miles N.E. from Washington, at 4,400′ elevation. The vein strikes W., and dips E., in granite. A shaft is down 25′, showing a 3′ vein, and at the shaft-mouth a tunnel has been run 60′ on the vein. Idle. R. Maloney, of Washington, owner.

Rocky Bar Mine (Drift).—See our XIIth Report, p. 199. It is ½ mile E. from Washington, at 2,650′ elevation, and comprises 3,000′ on the channel of the South Yuba River. Since our last Report 250 sq. ft. of the channel have been worked, and a 1,000′ drift run up and across the channel. The derrick, with 75′ mast and 65′ boom, is worked by a 16′ overshot wheel, using 300 miner's inches of water, from Poorman's and Cañon creeks, brought through 4 miles of ditch. Six men are employed. J. O. & E. A. Hayes, of Washington, owners.

Rocky Bar Mine (Quartz).—See Massachusetts.

Rocky Bar Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 433 and 200. It is on Osborne Hill, 2 miles S.E. of Grass Valley. Idle. H. Sylvester, of Grass Valley, owner.

Rose Hill Mine (Quartz).—It is in South Grass Valley, at 2,600′ elevation, and comprises 12 acres of ground on two parallel N. and S. ledges, one pitching E. and the other W., in a grano-diorite formation; they vary in width from a few inches to a couple of feet. A 860′ tunnel taps the ledge and is intersected by a vertical shaft 120′ deep, from which several hundred feet of drifts have been run. There is a 3-stamp double-discharge mill, with 950-lb. stamps, run by a gasoline-engine, to be changed to electrical power later. It is furnished with a swinging apron, and crushes 5 tons in twenty-four hours. Idle. An incorporated company, of No. 320 Sansome Street, San Francisco, owner; R. D. Lawrey, of Grass Valley, superintendent.

Russell Ravine Mine (Quartz).—See Glenn.

Sanders Mine (Quartz).—See Electrical Mining Co.

San José Mine (Drift).—See our XIIth Report, p. 201. It is on Deer Creek, 6 miles E. of Washington. Idle. An incorporated company, of San José, owner.

Sauvee Mine (Quartz).—It is 1 mile S. of Grass Valley, at 2,475′ elevation, and comprises 91 acres of patented land. Five veins have been found crossing the property, varying from 1′ to 5′ in thickness, supposed to be extensions of the W. Y. O. D., Pennsylvania, Bullion, and Diamond mines. The general strike is N. and S., and they all pitch W., and are from 150′ to 300′ apart, in a grano-diorite formation near the slate contact. At the north end of the claim, between two veins, is a 185′ vertical shaft, furnished with a steam hoist. On the south side of the claim, ½ mile distant, is a tunnel, cross-cutting 400′ and then turned 400′ on the vein, showing 2′ of quartz well mineralized. One hundred feet from the breast is a cross-cut 700′ long to a solid body of sulphurets 30′ wide. This tunnel gives 60′ of backs, all stoped to the surface. Idle. Mrs. F. Sauvee, of Grass Valley, owner.

Sebastopol Mine (Quartz).—It is on Osborne Hill, 2¾ miles S.E. of Grass Valley, at 2,700′ elevation, and comprises 2,200′ by 300′ at one end line and 500′ at the other, patented ground. The 4″ to 10″ vein strikes W. of N., and dips 45° W., between diorite walls. The quartz is said to carry 1½% sulphurets of a good grade. The new double-compartment incline is 105′ deep; the old incline was 250′ deep; several shaft prospects have been sunk to water-level. There is also an 800′ drain tunnel. Idle. J. Bennallack et al., of Grass Valley, owners.

Sirius Mine (Quartz).—It is 7 miles E. from Washington, at 4,300′ elevation. The vein, from 3′ to 4′ wide, strikes N. and S., and dips E., in porphyritic granite. It has been worked through a 4′x 6′ incline, 65′ deep, sunk on the vein; also by a 190′ tunnel on the vein. Idle. C. O. Anderson et al., of Nevada City, owners.

Slate Ledge Mine (Quartz).—It is 5 miles S. of Grass Valley, at 1,840′ elevation, and comprises 40 acres. The vein has an E. and W. course and dips 30° S., averaging from 16″ to 18″ in width, between slate and diorite walls. The quartz is said to carry 2% sulphurets. The vein is worked through a tunnel, 793′ long, to a station, where an incline has been sunk 347′ below; the tunnel is continued for 1,000′ on the other side of the incline. Four drifts extend E. from the incline, below the tunnel level, to distances of 954′, 636′, and 540′, showing three ore-shoots pitching west. Most of the vein above the main tunnel is stoped out. An upraise from the shaft to the surface permits of the use of water-power for hoisting and pumping, with a 4′ hurdy wheel, which takes the water under 100′ head. The 4″ bucket- and lift-pump has a 4′ stroke and makes 10 strokes per minute. The water is taken from irrigation ditches belonging on the property, fed from Wolf Creek. One half mile from the mouth of the tunnel is a 10-stamp mill, with 750-lb. stamps, which crushes 1¾ tons per stamp, and is furnished with two Johnston concentrators; the whole is run by a 6′ hurdy wheel under 30′ head. Seven men are employed in the mine and two in the mill, when running.

An incorporated company, of Grass Valley, owner; A. F. Perrin, of Grass Valley, secretary and superintendent.

Sleeping Beauty Mine (Quartz).—It is 3 miles N.E. from Moore's Flat, at 3,100′ elevation, and comprises two claims on the Middle Fork of the Yuba River. The 1′ to 6′ vein strikes N.W., and dips 40° S.W., in a greenstone formation. The vein carries a large percentage of arsenical pyrites, and above water-level the quartz carries coarse, heavy gold. There are two tunnels, one at each end of the claim; the longer one is 130′, and has a 30′ incline below it, and an upraise and stopes to the surface. The second tunnel is on a lower level, farther up the river. The richest ore is worked in a hand-mortar. Two men are prospecting the ground. Rander & Vizzard, of Moore's Flat, owners.

South End Mine (Quartz).—See Goodall Consolidated.

South Idaho Mine (Quartz).—It is 1 mile E. of Grass Valley, at 2,500′ elevation, and comprises 2,300′ by 600′. The vein trends S.E., running parallel with the Idaho, and dips S., between slate walls. There is a vertical shaft, 100′ deep, with a 20′ cross-cut to the other side of the vein and a short drift of 15′ along the foot-wall. The ore is said to carry 4% of sulphurets. A 12′ cross-cut at the 60′ level did not reach the wall. The hoist is a horse-whim. Two men are at work. D. C. Webster, of Grass Valley, owner.

Spanish Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 442 and 200. It is 3 miles W. from Washington, at 2,700′ elevation. Since our last Report the mill has been moved 300′ down the hill to the mouth of the lowest tunnel, and 4 new Huntington mills and 10 stamps added, bringing the mill capacity up to 100 tons per day. All the mining is carried on through the deepest tunnel. Water-power is used under 600′ pressure. Twenty men are employed. F. W. Bradley, of Wardner, Idaho, owner; D. Johnson, of Washington, superintendent.

Spanish Mine (Quartz).—See our XIth and XIIth Reports, pp. 292 and 200. It is on Woods Ravine, 1¼ miles N.W. of Nevada City, at 2,500′ elevation. The vein strikes N. and S., in granite, and is over 3′ in width, carrying low-grade quartz, heavily sulphuretted. Since our last Report a 10-stamp mill has been erected and a hoisting and pumping plant put on, sufficient to go 1,000′ in depth. The mine is opened with a 400′ incline. Two men are pumping water. R. R. Colgate, of New York, owner; A. L. Begbie, of Nevada City, superintendent.

St. Louis and Wide West Mine (Quartz).—See Alpine.

Stacey Mine (Quartz).—See Glenn.

Stanford (*Oro Fino*) *Mine* (Quartz).—It is 4 miles W. of Nevada City, at 2,450′ elevation, and comprises 2,200′ by 600′. The vein strikes N.W., and dips N.E., changing from 50° near the surface to 25° below the 200′ level. The fissure is partly filled with gangue, carrying short ore-shoots of about 100′ in length. The double-compartment 5′x 7′ main incline is 315′ deep, tapped 40′ from surface by a 650′ drain, and with levels below the adit, extending both N. and S., about 100′ along the fissure. Ore for the mill is supplied from stopes between the second and third levels S. of the shaft. The 10-stamp mill has 950-lb. stamps, dropping 90 times per minute on 6″ drop, crushing 10 tons on day shift only. The hoist and pump, as well as the mill, are run by water-power from South Yuba ditch; the former two with a 9′ Pelton wheel under 170′ head, while the mill has a 4½′ Pelton wheel, and the four Frue vanners a 2′ wheel.

Twelve men are employed. — Curry and Judge Caldwell, of Nevada City, owners.

St. Gotthardt Mine (Quartz).—See our XIIth Report, p. 201. It is 4 miles N. of Columbia Hill. Idle. An incorporated company, owner.

St. Johns Mine (Quartz).—See our XIth and XIIth Reports, pp. 281 and 201. It is on Alta Hill, ½ mile N. of Grass Valley, at 2,450′ elevation, and comprises 3,720′ patented ground, on two E. and W. parallel veins along the contact of slate and serpentine, dipping 50° N. Idle. An incorporated company, owner; William Berry, of Grass Valley, manager.

St. Louis Mine (Quartz).—See Alpine.

Stockbridge Mine (Quartz).—See Massachusetts Hill.

Summit Consolidated Gold Mining Co.'s (*Fortuna*) *Mine.*—It is 1 mile S. of Nevada City, at 2,700′ elevation, and comprises four claims, known as *Dodo*, *Fortuna*, *Orleans*, and *Thomas.* The vein courses N.W. and S.E., and dips S.W., in slate and diabase, carrying a heavy percentage of sulphurets, with ribbon quartz. It is being worked under a bond; the old Fortuna shaft, 240′ deep, is being cleaned out and sunk deeper. There is a steam hoist and pump on the shaft, and 8 men are employed. Englebright, Waggoner, et al., of Nevada City, owners; G. A. Nihell, of Nevada City, superintendent.

Sunny South Mine (Quartz).—See Gray Eagle.

Sweet's Flat (*Tung Kow*) *Mine* (Placer).—It is 1½ miles S. of Washington, and comprises 10 acres of gravel. The gravel bank is 15′ high, carrying many heavy bowlders, and requiring a water-power derrick with a 55′ boom. The gravel requires blasting, and is washed through 10 boxes set on a 4″ grade, lined with wooden blocks; water is taken from Jephson Creek, the season lasting five months. Eight Chinese, owners, are at work.

Syndicate Mine (Quartz).—It is in Sec. 2, T. 15 N., R. 8 E., 2½ miles S. of Grass Valley, adjoining the Allison Ranch Mine, at about 2,600′ elevation, and embraces the *Golden Chain*, *Great Eastern*, and *New Idea* claims, containing 53 acres in all. The vein strikes N.W., with a 40° E. dip that passes through the first two claims, while the latter has a parallel vein with a westerly dip, which shows in the bed of Wolf Creek. Idle. Wm. Berry et al., of Grass Valley, owners.

Treadwell (*Grass Valley*) *Tunnel Co.*—An incorporated company has been formed, and preliminary surveys are being made for the purpose of running a deep tunnel to drain the mines in the vicinity of Nevada City and Grass Valley. The initial point for the mouth of the tunnel is ¾ mile above Jones' Bar, on the south bank of the Yuba River. A depth of 1,400′ is expected to be attained at the Providence Mine. G. Treadwell, of Nevada City, manager.

Tung Kow Mine (Placer).—See Sweet's Flat.

Twin Sisters Mine (Quartz).—It is 2 miles S. of Eureka, at 3,100′ elevation, and comprises two claims with parallel veins about 8″ wide, striking N. and S., and dipping 45° W., between granite walls. It is a prospect, with a 20′ incline and an open cut. Two men are at work. J. Holligan et al., of Graniteville, owners.

Union Mine (Drift).—See our XIIth Report, p. 201. It is on Relief Hill, 3½ miles from Bloomfield, at 2,500′ elevation, and comprises 90 acres of ground. The bedrock tunnel is 2,000′ long to the channel, which is 220′ across, running E. and W., and is worked in breasts 6′ to

7′ high and 70′ wide, yielding 60 cars of 2,500 lbs. each per day. Two thirds of the gravel is cobbles and bowlders; the gold it contains is medium-coarse. The ore-dump holds 325 cars, and is washed twice a week through four strings of sluices with intermediate drops. A restraining dam in Union Cañon permits the tailings to be reworked. During the winter months wash-water is free; the rest of the season it is supplied from the Bloomfield ditch. Twenty-seven men are employed. — Jephson et al., of Relief, owners.

Union (*New York*) *Mine* (Quartz).—It is 3 miles E. of Nevada City, at 2,700′ elevation. The vein strikes N. and S., and dips 40° E., along the contact with a granite foot-wall. The vein averages 12″ in width and is said to carry 5% of high-grade sulphurets, mostly iron, but with some lead. The workings are carried on through a tunnel 1,100′ long on the vein, which gives 165′ of backs, which have been stoped for a length of 700′ to the surface. The old workings lie south of the present works. Assessment work only is being done. L. Nihell et al., of Nevada City, owners; G. Nihell, of Nevada City, superintendent.

Viola Mine (Quartz).—It is 4 miles N.E. of Cisco, at 7,000′ elevation. The vein, 8′ wide, strikes N.E., and dips 60° S.E., between syenite walls. There are two shafts, 20′ and 50′ deep, and three open cuts on the vein. Assessment work only. Mrs. Viola Davis and H. Smith, of Cisco, owners.

Washington Mine (Quartz).—See our VIIIth and Xth Reports, pp. 440 and 391. It is on the Yuba River, 6 miles E. of Washington, at 3,675′ elevation. Idle. A. Tregidgo, of Grass Valley, owner.

Waukeshaw Mine (Drift).—It is on Relief Hill, 3½ miles E. of North Bloomfield, at 3,675′ elevation, and comprises 150 acres. It was formerly a hydraulic mine. It has a bedrock tunnel, 2,600′ in length, through which the gravel is hauled in 3-car trains by mules. The gravel is also washed through a 1,900′ tunnel, dumping into the South Yuba River. This tunnel is 6½′x 4½′ by 7′ high. The gravel is breasted 6′ high, 35′ wide, and a breaster breaks down three 1-ton cars per shift. Two hundred miner's inches of wash-water, under 200′ head, is obtained from Logan Cañon, through a ditch 1,000′ long. The flume is 2′ wide, and set on a 10″ grade. Ten men are employed. J. R. Jones et al., of Relief Hill, owners.

West Delhi Mine (Quartz).—It is 3½ miles N.W. of North Columbia, at 2,550′ elevation, and comprises three claims. The 6′ vein trends N. 20° W., and dips 55° E., in a slate formation. It is opened by tunnels, which will ultimately give 2,000′ of backs. The present tunnel, a cross-cut 300′ long, will require to be extended another 100′ to reach the vein, with 150′ of backs. There is an 8-stamp water-power mill with 900-lb. stamps, crushing 15 tons per day, and 4 Hendy old-style concentrators. Six men are at work in the tunnel. R. McMurray et al., of San Francisco, owners; C. H. Mallen, of Nevada City, superintendent.

West Harmony Mine (Drift).—See Delaware.

White Wings Mine (Quartz).—It is 6 miles N.W. from Nevada City. The 16″ vein strikes N.W., and dips 60° S.W., between slate walls. The quartz is heavily mineralized, the sulphurets being of medium grade. The developments consist of a cross-cut tunnel 150′ to the vein, which continues 100′ along the same. The old workings have been abandoned. Four men are at work. C. Moody et al., of Nevada City, owners.

Wild West Mine (Quartz).—See Alpine.

William Penn Mine (Quartz).—See Crown Point.

Willow Valley Mine (Quartz).—It is in Sec. 4, T. 16 N., R. 9 E., in Willow Valley, 3 miles E. from Nevada City, at 2,900′ elevation. The vein strikes N.E., and dips 30° N.W., in granite; the extreme northeast end reaching into the slate. The developments consist of an incline shaft 250′ deep, not accessible at present, and a 260′ cross-cut to the vein. Idle. G. W. Welch, of San Francisco, owner.

Winfield Scott Mine (Quartz).—See our XIth and XIIth Reports, pp. 283 and 203. It is 3 miles S.E. from Grass Valley, and has been worked by the Hartery Mining Co., of Grass Valley, owner.

Wisconsin and Illinois Mine (Quartz).—See our Xth and XIth Reports, pp. 375 and 284. It is 4 miles S. of Grass Valley, at 2,300′ elevation. The vein is about 13″ wide, strikes E. and W., and dips 40° S. Worked mostly by tributers. It is opened by a 5′x 14′ incline to a depth of 500′, and is furnished with steam hoist and pumps. About 27 men are employed. J. N. Lakenan, of Grass Valley, owner.

W. Y. O. D. Mine (Quartz).—See our VIIIth, Xth, and XIth Reports, pp. 435, 379, and 268. It is 1 mile S. of Grass Valley, at 2,610′ elevation, and comprises 1,900 by 600′. The main vein strikes N. 6° W., and dips 38° W.; there is a parallel back vein about 400′ distant that has not been developed yet; the walls are slate and syenite on the hanging and slate and grano-diorite on the foot, with an occasional chlorite casing. The quartz, which has an average width of 15″, is well mineralized, and said to carry 3% of high-grade sulphurets. Several pay-shoots have been developed. During 1895 the following work was done: 500′ of sinking, 1,700′ of upraises, and 3,800′ of drifts. The mill has 20 stamps weighing 850 lbs. each, and crushing 2½ tons per stamp through No. 40 tin-punched screen. There are 16′ of apron-plate set on grade 1¾″ per foot, 8 Frue vanners, two 4′ clean-up pans, and 1 barrel, all run by steam-power. The air-compressor drives 6 Rand drills; the hoisting engine is 75 H.P., and there are 8 pumps. The entire plant is very complete. Eighty-five men are at work. An incorporated company, of Grass Valley, owner; T. H. Simonds, of Grass Valley, superintendent.

Wyoming Consolidated Mine (Quartz).—It is in South Grass Valley, at 2,625′ elevation, and comprises 2,900′ along the lode, but of varying width of side lines. The different claims are designated the *Crandall*, *Narragansett*, and *Wyoming*. The first and third are on a N. and S. vein 1′ to 3′ wide, and dip 30° W., in syenite formation. The Narragansett is 700′x 300′ and on a N.E. vein 1′ to 3′ wide, and dips 30° N.W., intersecting the other vein in syenite. The quartz is well mineralized with lead and iron sulphurets. A 5′x 8′ incline is 208′ deep on the N. and S. vein, with 200′ drifts both N. and S. A tunnel 275′ long has not reached the vein yet. On the Narragansett a 400′ drift reaches the vein in 300′ and then turns 100′ on vein, giving 70′ of backs. This vein has less sulphurets, but is said to be high grade. Idle. An incorporated company, of Grass Valley, owner; B. F. Runnels, of Grass Valley, manager.

Wyoming Mine (Quartz).—See our VIth (Part II), XIth, and XIIth Reports, pp. 48, 291, and 203. The property is now owned by the Champion Mining Co., and worked in connection with the Champion and Merrifield mines. F. Zeitler, of Nevada City, superintendent.

Yellow Diamond Mine (Quartz).—It is 4 miles W. of Nevada City, at 2,400′ elevation, and comprises two full claims. The vein strikes N.W., and dips 45° N.E. in the granite close to the contact, and is from 2′ to 4′ wide. The quartz carries about 1% of sulphurets, said to be high grade. There is an incline 70′ deep, and some drifts have been run. The pumps and hoist are driven by water from the South Yuba Co.'s ditch, delivered to two 5′ Pelton wheels under 125′ pressure. Idle. A. F. Derington et al., of Washington, owners.

Y. Way Co. Mine (Placer).—It is ¼ mile S. from Washington. The gravel bank is 20′ high, and the cut 4′ wide and 60′ long. A water-power derrick with 55′ boom is required to remove the bowlders. Twenty-five boxes for washing are used, set on 6″ grade and paved with wooden blocks. Water is taken from South Yuba River. The season lasts eight months. Ten Chinese, owners, are at work.

Zuver Bros.' Mine (Drift).—It is on Doolittle Hill, 9 miles N. of Emigrant Gap, at 5,825′ elevation, and comprises 80 acres on the course of an ancient channel, supposed to be the same that has been worked at the Omega Mine. It has a N.E. and S.W. course, and is between 400′ and 500′ in width, with 8′ of gravel, capped by 15′ of cement and 7′ of pipe-clay. There is a 5′ x 6′ bedrock tunnel 800′ long, from which an upraise of 30′ extends into the gravel. The gangway is driven south across the channel, which is breasted 70′ wide and 6′ high, and timbered with post and cap and lagged overhead. A breaster takes out 20 carloads, of 1,500 lbs. each, per shift. The channel carries considerable water. A second lower tunnel is being started farther north. Wash-water is obtained from South Fall Creek, through 1½ miles of 2′ x 3′ ditch of 900 miner's inches capacity. The tail flume is 2′ wide and 300′ long, and paved with Hungarian riffles, and is cleaned up twice per season; the gold is coarse. Zuver Bros., of Emigrant Gap, Placer County, owners.

MILLS IN NEVADA COUNTY.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of Each, in Lbs.	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
					No.	Character.	No.	Capacity.		
Baltic	Steam	20								
Blue Bell	Water	10	850	44						
Bluejay	Water	5	750	10						135 sq. ft.
Brunswick Consolidated	Water	5	800	10						
Bulldozer	Water									
California No. 1	Water	10	750	50						
California No. 2	Steam	10	850							
Champion Consolidated	Water	30	850	75	12		1	4 tons.		
Champion Consolidated (new mill)	Water	40	1,000	95						
Conlan	Steam	10	750							
Coan	Water	4	750							
Crown Point	Water	10	750	17½	2	Triumph				
Culbertson	Water	10	1,000	20						192 sq. ft.
Diamond Creek Consolidated	Water	20	850	60	4	Johnson				
Delaware	Water	15	850	120						
Dillon	Water	4	650	8						
Electrical	Steam	20	1,000		8	Frue				
Empire (no data)										
English Mountain	Steam	20	1,000	40						
Excelsior	Steam	10	900	30						
Federal Loan	Water	10	850	25	1	Triumph				
Forlorn Hope	Water	5	750							
Gambrinus	Water	5								
Gaston Ridge	Steam	10	750	30						
German	Water	10	1,000	20						96 sq. ft.
Gold Point	Steam	10	1,000	20	2	Hendy				
Granite Hill	Water	5	850	5	1	Woodbury				120 sq. ft.
Harmony	Water	10	850	120						
Hartery Consolidated	Water	10	850							
Larrimer	Water	10								
Last Chance	Steam	5	750	7½						
Lone Star	Water	8	900	16	4	Frue				
Malony & Fouch	Water	2	110	1						
Maryland	Water	40	850	80	12 4	Frue Triumph				

MILLS IN NEVADA COUNTY—Continued.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of Each, in Lbs.	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
					No.	Character.	No.	Capacity.		
Mayflower	Water	20	900	40	8	Frue				
Mountaineer	Water	15	850	15	6	Frue				
Mountain View		3	1,000	7½						
National*	Water	5		22	2	Frue				
Nevada County	Water	10	850	20						
North Banner	Water	5	1,000	20						
North Star	Water	40	1,000	80	4 12	Frue Triumph				
New Pittsburg	Water	10	1,000	20	4	Frue				
Omaha Consolidated	Water	10	900	16						
Original Empire	Water	40	1,000	100						
Orleans		5	850	9	1	Hendy				
Osborne Hill	Steam	20	1,000		8	Frue & Johnson				
Pennsylvania	Steam	5	750	8	1	Woodbury				
Providence	Water	40	850	75–80	16	Frue	1	4 tons.		
Reward	Water	10								
Rocky Bar (no data)										
Rocky Glen	Water	10	800	23						
Rogers	Water	10	850	15						
Rose Hill	Gasoline	3	950	5						
Slate Ledge	Water	10	750	17½	2	Johnson				
Southern	Water	10	750	15	4					
Spanish (1)*	Water	10	750	100						
Spanish (2)	Water	10	850	25	4	Frue				
Stanford	Water	10	950	10	4	Frue				
Washington	Water	20	850	44						
West Delhi	Water	8	900	15	4	Hendy				
W. Y. O. D.	Steam	20	850	50						
Yuba	Water	15	900	30						

In addition to stamps, the mills marked with a * have additional crushing capacity, as noted in the following list:

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN NEVADA COUNTY.

Name of Mill or Mine.	Power.	Number	Character.	Diameter	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
						No.	Character.	No.	Capacity.		
Bullion Consolidated		1	Griffin								
Imperial Paint and Copper Co.			"Grinding"								
Lone Ridge		1	Arrastra	8′	1						
Mount George	Water		Arrastra								
National		1	Huntington	5′							
Nevada County Reduction Works			Tustin					1	4 tons.		
North San Juan	Steam		Huntington	5′							
Oro Grande			PatentGrinder		12						
Pioneer Reduction Co.	Steam		Tustin		6			1	4 tons.		
Spanish (1)			Huntington								

Orange County.

Gold-mining in this county is an industry of little or no importance. Some prospecting, however, is being done near Trabuco Cañon, and in the mountains west of Lake Elsinore some gold prospects have been found. Within the past year several parties were prospecting the brush-covered hill, it having been claimed that rich gold float had been found.

Shirley Mine (Quartz).—It is in Trabuco Cañon, 20 miles E. of Santa Ana, at 2,500′ elevation. Two tunnels, 163′ and 215′ long respectively, have been driven into the mountains; several hundred pounds of gold-bearing quartz were found on the surface. John M. Shirley, of Santa Ana, owner.

Yaeger Mine (Quartz).—It is near the head of Trabuco Cañon, at 3,500′ elevation. Quite a little prospecting work has been done, and it is claimed gold has been found. G. Yaeger, of Santa Ana, owner.

Placer County.

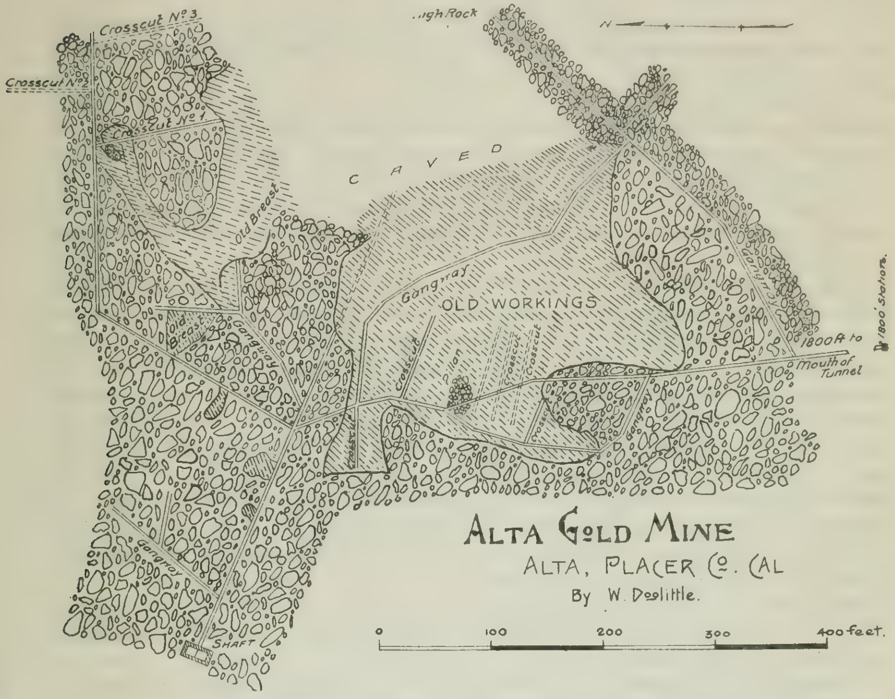
Increased activity in mining is noticeable in Placer County. In Ophir District nearly all the mines of prominence are being operated, and there are indications that others will soon be started up, after a long idleness. On the Forest Hill Divide several new enterprises have been inaugurated, and new discoveries recently made in some of the leading old mines indicate the long continuance of active operations in them. East and southeast of the Forest Hill Divide new companies are at work, and are meeting every encouragement. Placer County has a great diversity of resources. The industries of this county are gold-mining, agriculture, horticulture, viticulture, stock-raising, granite-quarrying, pottery manufacture, etc. More or less irrigation is carried on in the foothills, where water can be brought down from the mountains. The valley lands are well supplied by subterranean water, from wells tapped at moderate depths. See our XIth Report, p. 319.

Adams Mine (Quartz).—It is 2½ miles S.W. of Auburn, at 1,050′ elevation. A shaft has been sunk 200′ on a small vein. The mine has a steam hoist, but no mill. Flooded and idle. Calvin T. Adams, of Newcastle, owner.

Allbright Mine (Drift).—See our XIIth Report, p. 204. It is 2 miles E. of Penryn. Idle.

Alta Gold Mining Development Co.'s Mine (Drift).—It is at Alta, at 3,380′ elevation, and comprises the *Alta*, *Bradley & Gardner*, *Deep Blue*, *Erskine*, *Linn*, and S.E. ¼ of Sec. 36. The main working tunnel is 2,900′ in length, and at 2,400′ taps a shaft 180′ deep, through which ventilation is obtained. Formerly a water-blast was employed. Three main cross-cuts have been driven: one, W. of N., is 120′ long, and one S.E. is 216′ long, while the third has just been started; all three are in gravel. When breasting, from 30 to 40 carloads of gravel per day are broken, but the present work is of an exploratory nature. The gravel carries about 60% of bowlders and cobbles, which are mostly stored in the mine. The wash-dump holds 200 cars of 1-ton capacity each, with 400′ of flume set on a 4″ grade, dropping into Cañon Creek, and using about 90 miner's inches of creek water for washing. Eight men are employed. An incorporated company, owner; J. P. Edoff, of 215 Califorina Street, San Francisco, secretary; J. E. Doolittle, of San Francisco, superintendent.

American Bar Mine (Quartz).—See our XIIth Report, p. 204. It is 2 miles S.W. of Michigan Bluff, at 1,900′ elevation. It was worked quite extensively years ago. Active operations are soon to be resumed. The vein strikes N.E. and dips S.E. Three tunnels have been run on the vein. There is a 10-stamp water-power mill on the property. The company owns a ditch 3 miles in length. Eighteen men are employed when the mine is in operation. American Bar Mining Co., of Nevada City, owner; J. T. McCall, of Michigan Bluff, superintendent.



Avalon Co. (Schipman) Mine (Drift).—It is in Canada Hill District, near Tadpole. The company has secured 2½ miles on a channel which enters and passes out on the north side of Forest Hill Divide. The material of the channel is largely white quartz and bluish slate. Work has only recently commenced, and five men are employed. Avalon Mining Co., of San Francisco, owner; M. H. Worden, of Westville, superintendent.

Baker Divide Mine (Drift).—See our VIIIth and IXth Reports, pp. 466 and 29. It is 3 miles E. of Forest Hill. Idle.

Bald Mountain Mine (Drift).—It is on the E. side of Bald Mountain, 10 miles S.E. of Westville. Idle.

Barton Mine (Drift).—See our XIIth Report, p. 204. It is 3 miles E. of Rocklin. Dr. O. L. Barton et al., of Westville, owners.

Bella Union Mine (Quartz).—It is 3½ miles S.E. from Weimar, at 2,000′ elevation. The vein strikes E. of N., and dips 60° E., and consists of a broken mass of slate and quartz about 5′ wide, within slate walls. There are four cross-cut tunnels: No. 1 gives about 70′ of backs;

No. 2 is 40′ long, No. 3 is 120′, and No. 4 is 65′; this latter has to be driven about 35′ farther to reach the vein. Idle. D. Jones, of Clipper Cap, owner.

Bellevue Mine (Quartz).—It is 4 miles W. of Auburn, at 2,100′ elevation. It is the west extension of the Bullion Mine. It has a shaft 190′ deep. Some new work is now being done on another vein in the property by two men. Edward Trewelling, of Ophir, owner.

Belvoir (*Bowlder Extension*) *Mine* (Quartz).—See our XIIth Report, p. 205. It is in Ophir District, 3 miles E. of Auburn, at 1,000′ elevation. A tunnel has been run 800′ on the vein. Idle. J. Kaiser et al., of Ophir, owners.

Ben Franklin Mine (Drift).—See our XIIth Report, p. 205. It is near Yankee Jim's on Swindle Hill. Idle. J. N. Burke et al., of Yankee Jim's, owners.

Big Blue Mine (Quartz).—It is 3½ miles S. of Gold Run, at 3,050′ elevation, and comprises two claims, designated the *Big Blue* and the *Vulture.* The vein strikes N. and S., and dips E., and is about 5′ wide on the Big Blue and 12′ wide on the Vulture. On the former is a 70′ shaft, and on the latter a 100′ shaft, with two cross-cuts tapping the ledge. Assessment work only. Moody & Gayety, of Gold Run, owners.

Big Dipper (*Harmon or Waterhouse*) *Mine* (Drift).—See our VIIIth, Xth, and XIIth Reports, pp. 472, 423, and 205. It is 2 miles S.E. of Iowa Hill, at 3,000′ elevation. The workings have now been extended 3,000′ on the channel. There is no material change to report in the condition of the mine. The surface plant consists of a 10-stamp mill having 950-lb. stamps, and provided with grizzlies and a rock-breaker, and using No. 3 and No. 4 screens, and crushing 100 tons per day. The air-compressor, run by water-power, furnishes air to 3 drills. The mill has both steam and water power. The company runs its own ditch, 10 miles in length, taking water from Shirt-tail Cañon. Forty-five men are at work. Big Dipper Mining Co., of San Francisco, owner; George D. Blood, of Iowa Hill, superintendent.

Big Oak Tree (*Milford*) *Mine* (Quartz).—See our VIIIth Report, p. 463. It is 1 mile W. of Colfax, at 2,300′ elevation. Idle. An incorporated company, owner.

Bishop Mine (Placer).—It is 1 mile W. of Last Chance, and worked by two men. A. J. Bishop, of Michigan Bluff, owner.

Black Cañon Mine (Drift).—It is in Black Cañon, 5 miles S.E. of Westville, and is worked by a small force. — Walford, of Westville, superintendent.

Black Hawk Mine (Drift).—It is 3 miles N. of Forest Hill. A tunnel, run from Black Hawk Cañon, has reached the channel recently. W. A. Freeman et al., of Auburn, owners.

Black Oak Mine (Quartz).—It is 3 miles S. of Weimar (New England Mills), at 1,875′ elevation, and comprises 25 acres of ground. The 3½′ vein strikes a little E. of N., and dips 60° E., in a slate formation. There are two tunnels; the upper one on the vein is 288′ long, and gives 115′ of backs; the other, 140′ below, is a cross-cut tunnel 150′ to the vein, and turned on it 500′ N. and 225′ S. The quartz carries ½% of sulphurets. There are two pay-shoots on the claim, pitching south. Below the lower tunnel is a 5-stamp mill, run by a 24 H.P. steam-engine; it has 850-lb. stamps, dropped 95 times per minute, and crushing 2 tons to the stamp, with a consumption of one cord of wood in twenty-four hours. Two men are at work, drifting on an intermediate tunnel. L. P. Drexler, of No. 409 California Street, San Francisco, and G. D. Wyman, of Applegate, owners; J. T. Judd, of Weimar, superintendent.

Blue Cañon Mining and Development Co.'s Mine (Drift).—It is on the N.W. ¼ of Sec. 22, between Blue Cañon and Shady Run stations, at 3,900′ elevation, and comprises 1 mile along the main lava divide, between the North Fork of American River and Bear River. A tunnel has been started in the bedrock, 600′ below the railroad track, and is now 120′ in length, and will have to be extended 1,800′ farther. Four men work, on two shifts. An incorporated company, owner; J. B. Knapp, of Blue Cañon, secretary.

Bob Lewis Mine (Drift).—It is 2 miles S.E. of Damascus, and lies parallel with the Mountain Gate Mine. Idle. Estate of Robert Lewis, of Damascus, owner.

Bowen Mine (Drift).—It is 2 miles N.E. of Michigan Bluff, at 3,400′ elevation. There are three separate channels in the property. That on the eastern side is opened 1,000′ along the channel, and the indications are that it may be a portion of the Weske channel—the gravel is similar and the tufaceous capping is identical, being characterized by numerous cavities, or vuggs filled with a soft, mushy material of light color. The second channel is broad, and filled with great bowlders resembling the Manhattan channel of the Weske property. The third channel is higher than either of the former, and is now being worked, with good results, through a gangway 1,000′ long. There is no mill on the property, as the gravel is free. Six men are at work. A. C. Bowen, of Michigan Bluff, owner; F. A. Bowen, of Michigan Bluff, superintendent.

Bowlder Mine (Quartz).—See our XIIth Report, p. 205. It is 3 miles W. of Auburn, at 950′ elevation. The vein strikes N. 40° E., and dips 45° S.W. An inclined shaft has been sunk 250′, with water-power hoist. The mill has 8 stamps and one 6′ Johnston concentrator. The sulphurets average about 2½%. The vein is of good size, though not rich. Its characteristics are similar to those of other mines in Ophir District. Nineteen men are at work. D. H. Atchison et al., of Marshfield, Oregon, owners; C. C. Handy, superintendent.

Breece & Wheeler (Paragon) Mine (Drift).—See our VIIIth, IXth, Xth, and XIIth Reports, pp. 467, 29, 455, and 206. It is at Bath, 1½ miles N.E. of Forest Hill, at 2,900′ elevation. This mine was formerly operated on a large scale, but has of late years been worked in a smaller way, by lessees. The workings have been connected with those of the Mayflower Mine, making 4½ miles of continuous workings on this famous channel. A large portion of the upper lead of this channel remains unworked, as also a cross-channel known as the Orono, which also is being worked in the Mayflower ground. The property is equipped with a 10-stamp steam-power mill. Ventilation in the mine is effected by means of a blower, run by an overshot water-wheel, the water from the mine being used for this purpose. Twenty men are employed. Breece & Wheeler, of San Francisco, owners; W. H. Grennell, of Bath, superintendent.

Bullion Mine (Quartz).—It is on Bellevue Hill, 4 miles W. of Auburn, at 1,240′ elevation. After a long idleness, the mine is being reopened. There are two shafts, 100′ and 150′ deep, respectively, on a vein which strikes N.E., and dips 65° S.W. There is a small steam hoist on the mine. Five men are working. N. Waring, of Ophir, owner; J. C. Rood, of Ophir, superintendent.

Burns Mine (Drift).—It is ½ mile N. of Michigan Bluff, and is opened by a bedrock tunnel 800′ in length. Worked by two men. Burns Bros., of Michigan Bluff, owners.

Buttes Mine (Quartz).—See our VIIIth Report, p. 461. It is ¾ of a mile S.W. of Ophir. The vein strikes E. and W., and dips 45° S. Idle.

Calf Pasture Mine (Quartz).—It is 3½ miles N. of Auburn. It has a shaft 226′ deep, from which three levels have been driven. The vein strikes E. and W., and dips nearly vertically. There is a steam hoist on the mine, but no mill. Idle. B. F. Meyers, of Auburn, owner.

California Mine (Quartz).—It is 4 miles W. of Auburn. Worked extensively years ago, but now idle and dismantled. The deepest shaft, said to be 300′, is caved. Francis Fellows, of Ophir, owner.

California Mine (Quartz).—It is in Baltimore Ravine, 2½ miles S.W. of Auburn. It is a prospect, with superficial work. One man working. — Hubbell, of Auburn, owner.

Cañon Creek Tailings Mine (Placer).—It is 1 mile E. of Gold Run, at 2,900′ elevation, and comprises 1½ miles in length and the width of the cañon. All the former hydraulic works of the Gold Run side emptied into this creek; it has been worked down to the old, original gravel, through 25 sluice-boxes 14″ wide, and set on an 8″ grade. Cañon Creek furnishes the water. Twenty men are employed. J. Stewart and J. L. Gould, of Dutch Flat, owners.

Cedar Creek Mine (Drift).—See our XIIth Report, p. 206. It is 1 mile S. of Shady Run, at 3,500′ elevation, and comprises 460 acres along 1½ miles of an ancient channel, having a N. 30° W. course. A bedrock tunnel, 780′ long, was 14′ too high. A second one, started 60′ perpendicularly below, is now 250′ long and will extend to 760′, where an upraise will connect with the upper tunnel; it is furnished with steel T rails, and ventilated by water-blast with 7″ air pipes. The gravel is free white quartz, said to average $2 40 per car of 1-ton capacity, and is breasted 40′ wide, 5′ high, and timbered with post and cap. A breaster takes down 6 cars per shift, picking up 2′ of bedrock. The ground is somewhat swelling. The tail-flume is 500′ long, 14″ wide, set on an 18″ grade, and is in several sections, with 20′ drops. The dump is in a cañon leading to the American River. The first three boxes are cleaned up every day. Five men are employed. An incorporated company, owner; D. McDonald, of 306 Market Street, San Francisco, secretary; A. Rogers, of Towles, superintendent.

Champion Mine (Quartz).—See our XIIth Report, p. 206. It is 1½ miles N.E. of Michigan Bluff. There are two tunnels, 150′ and 200′ long, respectively, and a 40′ incline. No machinery. Worked by C. Knopfel, of Michigan Bluff, owner.

Cherokee Mine (Quartz).—See our XIIth Report, p. 206. It is 12 miles N.E. of Michigan Bluff and 2 miles N.E. of Last Chance. No work of consequence has been done since our last Report. A. Dixon, of Michigan Bluff, owner.

Chinese Co.'s Mine (Placer).—It is at Indiana Hill, where the American River cuts the Gold Run channel, at 2,700′ elevation, and comprises 20 acres. Twenty Chinese working.

Cochrane Mine (Hydraulic).—It is on the south side of Long Cañon, 16 miles S.E. of Michigan Bluff. Preparations are being made to hydraulic with 400 miner's inches of water under 100′ head. Four men are employed. M. Cochrane, of Michigan Bluff, owner.

Columbia Gold and Silver Mining Co.'s (*Three Stars*) *Mine* (Quartz).—See our XIIth Report, p. 206. It is in Ophir District, 7 miles W. of

Auburn, at 500′ elevation. The property is well equipped with hoisting and milling plant, etc., but is idle. B. F. Hartley, of Auburn, superintendent.

Crater Hill Mine (Quartz).—See our Xth and XIIth Reports, pp. 433 and 207. It is on Crater Hill, 4 miles W. of Auburn. Said to have been worked to a depth of 800′, but now idle and the hoist falling into decay.

Dahlonega Mine (Quartz).—It is 2 miles S. of Emigrant Gap, at 5,350′ elevation, and comprises one claim. The 2½′ vein strikes N.E., and dips S.E., in slate, the quartz being well mineralized. Three tunnels have been driven; No. 1 is 50′ long, No. 2 is 140′, and No. 3, the lowest, has not yet reached the vein and is 290′ long. The ground above the upper tunnel has been stoped to the surface. Below the tunnels is an 8-stamp steam-power mill, with 850-lb. stamps. Idle temporarily. H. H. Teal, of Emigrant Gap, and J. A. Hoagland, 1214 J Street, Sacramento, owners.

Dam Mine (Drift).—See Hidden Treasure.

Damascus (*Mountain Gate*) *Mine* (Drift).—See Hidden Treasure. Six men are employed, cleaning out old works.

Daniel Webster Mine (Quartz).—See our XIIth Report, p. 207. It is 1½ miles N.E. of Michigan Bluff. The vein strikes N. and dips 75° E. Formerly a producing mine, but now only represented by annual assessment work. Mrs. S. A. Powell, of Michigan Bluff, owner.

Dardanelles Mine (Drift).—See our VIIIth, IXth, Xth, and XIIth Reports, pp. 464, 29, 465, and 207. It is 1½ miles S.W. of Forest Hill, at 3,600′ elevation. It was formerly one of the leading mines of the county, but it is now worked in a small way by tributers. The mine is equipped with a 5-stamp mill, provided with both water and steam power. The capacity is 8 tons per stamp during twenty-four hours' run. Six men are working. Ownership in dispute. A. S. Votair, of Forest Hill, agent.

Dewey & Stocker Mine (Quartz).—It is 2 miles N.E. of Forest Hill, near Bath. A cross-cut tunnel is being driven by 2 men, to cut the vein. Dewey & Stocker, of Forest Hill, owners.

Dorrer Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 468 and 207. It is in Humbug District, 2 miles N.W. of Damascus, at 3,400′ elevation. The vein strikes N.W., and dips 80° S.E. Six men are engaged in prospecting. A. E. Franzell, of Towles, owner.

Drummond Mine (Quartz).—See our Xth and XIIth Reports, pp. 424 and 208. It is near Sugar Pine Mills, 8 miles N. of Forest Hill. There are two veins in the property, on each of which there is considerable work. A new tunnel is being run by 6 men under contract, this being the only work in progress at present. Hon. C. F. Reed, of Auburn, owner.

Eclipse and Good Easter Mines (Quartz).—See our Xth Report, p. 433. This property comprises a group of ten claims in Ophir District, at 1,000′ elevation. The vein strikes E., and dips 30° to 45° S. The main shaft is 297′ deep, with three main levels, at 200′, 250′, and 297′, respectively; drifting has been commenced at the bottom of the shaft in good ore. The hoist is run by water-power, using 60 miner's inches of water under 168′ head. The mill, also run by water-power, has 10 stamps of 850 lbs. each, which drop 5″ and 104 times per minute. The discharge is 7″ high. There are no concentrators in use. The sulphurets are saved on a series of riffles. Fifteen men are working. Eclipse Mining Co., of Auburn, owner; W. De Varilla, of Auburn, superintendent.

Elite Consolidated Gold Mine (Drift).—It is at Shady Run, on North Fork of American River, at 3,950′ elevation, and comprises three claims of about 400 acres. This is a prospect to develop an ancient channel, supposed to pass through the ridge. A tunnel has been driven 1,100′, with an incline at the back 158′ long, the last 25′ of which is in quartz gravel carrying a little fine gold. The bedrock is slate. Only assessment work is being done. R. Monroe et al., of Dutch Flat, owners.

Eureka Mine (Drift).—It is 3 miles N. of Sunny South, at 4,400′ elevation, and comprises 3,600 acres and 6 miles on the Dick channel. There are a number of old shafts and tunnels, the longest of which is 1,480′ without reaching the channel. The present tunnel is 7′x 7′, and is now 1,340′ long. It is being actively driven ahead at the rate of 170′ per month, with machine drills. It will require 470′ more to reach the channel, which was prospected by bore-holes. An 80 H.P. boiler and compressor furnish the power. Two hundred inches of free water may be obtained from East El Dorado Cañon through 1¼ miles of ditch. Twelve men are employed. Eureka Consolidated Drift Mining Co., owner; Felix Chappelet, president; D. M. Kent, of No. 330 Pine Street, San Francisco, secretary; Felix Chappelet, Jr., superintendent.

Flat Ravine Mine (Quartz).—See our XIIth Report, p. 208. It is on the south side of Bald Mountain, near Flat Ravine. Assessment work only is performed, annually. M. Savage, of Michigan Bluff, owner.

Franklin Mine (Drift).—It is 2 miles N.E. of Michigan Bluff, at 3,400′ elevation. Idle. A. Dixon, of Michigan Bluff, owner.

Glen Consolidated (*Gray Eagle*) *Mine* (Drift).—It is near Bald Mountain, 6 miles N. of Last Chance, at 5,600′ elevation. This company has 3 miles along the presumed course of an ancient channel which is capped with tufa and andesite bowlders. A cross-cut tunnel has been run through cement (volcanic ash) 200′ to the channel, which is an upper lead. The "bedrock" channel is 150′ lower, and has not been opened at all. Surface plant, consisting of large water-tank, flume, etc., is being put in place, preparatory to washing the gravel. It is a new enterprise, for which the outlook is promising. Five men are employed. Glen Cons. Gravel Mining Co., of Forest Hill, owner; J. Shields, of Michigan Bluff, superintendent.

Gold Blossom Mine (Quartz).—See our Xth and XIIth Reports, pp. 431 and 209. It is on Crater Hill, 4 miles W. of Auburn, and comprises 5,800′ on the lead which forms a junction of the Crater Hill vein and the Gold Blossom vein, in the mine of the latter name. There are three claims: *Back Action*, having 1,000′; *Gold Blossom*, 1,800′, and *Gold Blossom No. 2*, 3,000′, on the lode. The vein strikes E. and W., and dips 85° S. The shaft is sunk at this angle, and is 220′ deep. A tunnel has been run 100′ to the vein on the Gold Blossom No. 2, and a drift run 450′ along the vein, besides which there is some superficial work. On the Gold Blossom No. 2 is a 10-stamp water-power mill with stamps of 950 lbs. each. The mill is used in milling quartz from each of the mines of the group. On the original Gold Blossom is a 10-stamp mill having a lot of accessory machinery, including revolving steel barrels, with electric attachment, a rotary roaster, mercury traps, etc., all designed to work what was considered an unusually refractory quartz. The machinery was given a trial and the process abandoned, as better results are obtainable by a process of careful amalgamation and concentration. Fifteen men are employed. Hon. C. F. Reed, of Auburn, owner; J. L. Grimes, superintendent.

Golden River (*Red Point*) *Mine* (Drift).—See our VIIIth, IXth, Xth, and XIIth Reports, pp. 470, 29, 456, and 208. It is 1½ miles S.E. of Damascus. During the past two years the breasts have been advanced 2,000′ up stream. The face is now 1¾ miles from the mouth of the tunnel. Ventilation is secured by means of a No. 4½ blower driven by water-power. Fifty-eight men are employed. Golden River Mining Co., of Paris, France, owner; Charles F. Hoffman, of Damascus, superintendent.

Golden Scepter (*Ellen Dip*) *Mine* (Quartz).—It is in Sec. 3, T. 13 N., R. 9 E., 2½ miles S. of Weimar, at 1,625′ elevation at top of the claim and 1,235′ on the creek level, and comprises 84 acres. The auriferous belt lies along the irregular contact of slate and serpentine, the latter intruding short spurs into the former, along which seams are worked. The heaviest body of quartz trends N. 37° W., with nearly a perpendicular dip, and shows a width form 2′ to 20′. The surface was formerly hydraulicked, but is opened now by three tunnels, 130′, 50′, and 90′ in length, and a 16′ shaft. Two men are employed. F. Ephraim and Mrs. Phillips, of San Francisco, owners; R. H. Young, F. F. Woodworth, and J. E. Farrel, of Weimar, lessees.

Golden Shaft Mine (Drift).—It is in Dutch Flat, at 3,175′ elevation, and comprises 8½ acres. There is a 4′x 6′ double-compartment shaft, 100′ deep in gravel, with 100′ of gangway; the breasts are taken 6′ high and 40′ wide in a blue gravel carrying 33% of bowlders. A water-power hoist and a 3″ Cornish pump are placed at the shaft. There is an 8-stamp water-power cement mill, with 950-lb. stamps, run at 95 drops, with a crushing capacity of 56 tons per day, and 300′ of sluices. Eighty miner's inches of water are furnished by the South Yuba Ditch Co., under 130′ head. E. Mallows, of Dutch Flat, owner.

Gold Ring Mine (Drift).—It is in Green Valley, on the American River, 2½ miles S.E. of Towles, at 1,500′ elevation, and comprises 63 acres on an ancient channel, having a N. and S. course. Twelve hundred feet have been worked on the west rim, the east rim not having been touched. The workings, started where the channel broke out on the west rim, are 8′ high and with 30′ breasts, the cemented gravel being crushed in a 10-stamp water-power mill, with 850-lb. stamps, of 40 tons capacity per day. Forty inches of water are taken from Giant Gap Cañon, through ¼ mile of ditch, and applied under 200′ pressure. A water-power hoist is employed to raise the gravel to the top of the mill. The east rim is to be worked on the same level through a new tunnel carried half in the serpentine bedrock. Thirty men are employed. An incorporated company, of Oakland, owner; A. Ames, of Towles, superintendent.

Gold Run Mining and Ditch Co.'s Mines (Hydraulic).—See our XIIth Report, p. 209. They lie between Dutch Flat and the American River, at 3,175′ elevation, and comprise about 7 miles of ground. An incorporated company, owner; J. L. Gould, of Dutch Flat, manager.

Good Easter Mine (Quartz).—See Eclipse.

Gray Eagle Mine (Drift).—It is 5 miles N.W. of Forest Hill. This mine has an air-shaft 360′ deep. When sunk it was presumed to be in the channel. A bedrock tunnel was then run from the north side of the Forest Hill Divide, but when it reached the gravel it was learned a mistake has been made and that the shaft, though on bedrock, was not in the channel. The tunnel was then turned up stream and has been run several thousand feet in that direction—the tunnel is now 8,000′ in length. Ventilation is secured by means of a blower, driven by water-power. At 80′ from the surface in the shaft a heavy flow of water was encountered, and is taken up and carried by pipe to the bottom of the mine, where the blower is located. The mine is provided with a 10-stamp steam-power mill, which is usually run twelve hours a day. Twenty-eight men are employed. Gray Eagle Gravel Mining Co., of San Francisco, owner; George During, of Forest Hill, superintendent.

Green Mine (Quartz).—See our XIIth Report, p. 209. It is on Crater Hill, near Ophir. Idle.

Harmon Mine (Drift).—See Big Dipper.

Hathaway Mine (Quartz).—See our Xth Report, p. 429. It is in Ophir District, 3½ miles S.W. of Auburn, at 760′ elevation. The vein strikes N. 75° W., and dips 75° southerly. The main shaft is now 456′ deep, and sinking will be continued to 600′ in depth. There are also three other shafts, 75′, 100′, and 125′ deep, respectively, none of which are in use. There are between 3,000′ and 4,000′ of levels open, and considerable stoping has been done. Both hoist and mill are run by water-power. The mill has 20 stamps and is provided with 4 concentrators. The sulphurets average about 2%, consisting of galena, blende, pyrite, marcasite, chalcopyrite, and occasionally tetrahedrite (gray copper). Fifty men are employed. Hathaway Gold Mining Co., of San Francisco, owner; Asa B. Eastwood, of Newcastle, superintendent.

Haub Mine (Drift).—It is ½ mile E. of Shady Run Station, at 3,720′ elevation, and comprises 33 acres on an ancient channel. There is a tunnel, 965′ long, with a 30′ perpendicular upraise at the end and a 60′ slope into the channel, carrying white quartz gravel, with 50% of cobbles and bowlders, which are stored in the mine. The breasts are carried 5′ high and 40′ wide, and are timbered in sets. One breaster can break down 5 cars, of 13 cu. ft. each, in a shift. The mine is ventilated with a water-blast of 20′ drop, and 960′ of 6″ pipe. Wash-water is obtained from springs; the tail flume consists of 11 boxes, 12″ wide, set on a 11″ grade, and drops into Shady Run Cañon. Four men are employed. C. Haub, of Blue Cañon, owner.

Herman (*Osborne*) *Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 472 and 211. It is 6 miles N. of Deadwood, at 5,000′ elevation. Two tunnels, 150′ and 500′ long, respectively, have been driven on the vein, and a cross-cut tunnel has been driven 300′ to the vein and a drift run along the vein several hundred feet. These three levels are connected, and considerable stoping done on each of them. The vein strikes N., and dips 70° E. It is irregular and illy defined, the walls being a slaty rock, accompanied with a dike of indeterminable character, very much decayed. The management contemplates driving another cross-cut tunnel, 1,300′ in length, which will cut under the present lowest level nearly 500′. The steam-power mill has 10 stamps of 1,000 lbs. each, and is provided with 4 Union concentrators. Thirty-two men are at work. Herman Mining Co., of San Francisco, owner; Dr. O. L. Barton, of Westville, superintendent.

Hermit Mine (Drift).—This property includes the *Gould*, *Hermit Nos. 1 and 2*, *Hill & Hansen*, and *O'Donnell* claims, and is 2½ miles N.E. of Michigan Bluff, at 3,400′ elevation. A tunnel has been driven 1,900′ into the mountain, in a northwesterly direction, with a view of prospecting the ground, and particularly in hope of encountering the famous

Red Point channel. At present an upper lead of free-washing gravel is being worked by lessees. The new drift is in 300′, and is connected by a winze with the main tunnel below. The upper lead is 75′ higher than the tunnel. Two men are working. F. A. & A. C. Bowen, of Michigan Bluff, owners.

Hidden Treasure Mine (Drift).—See our VIIIth, IXth, Xth, and XIIth Reports, pp. 469, 29–120, 451, and 209. It is at Sunny South, 4 miles N. of Michigan Bluff, at 3,700′ elevation. The mines comprised in this group are the *Cameron*, *Hidden Treasure*, and *Mountain Gate*, on the great Damascus or Sunny South channel, and the *Dam*, on the Dam channel. Years since the Hidden Treasure and Mountain Gate were worked extensively, first on the west side, and later the Hidden Treasure was worked on the east side. The east side of the Mountain Gate is intact and preparations are now being made to reopen and work on the east side of that mine also. The Dam tunnel has progressed several thousand feet since last referred to in our Reports. The workings reached a point in front of the north end of the old workings of the Hidden Treasure, but 30′ lower than the latter. It has been found that the Dam channel is swinging more to the eastward than was anticipated. A drift was run northwesterly in the hope of encountering the Red Point channel. A 30′ raise was made, and the white gravel of the famous Hidden Treasure channel encountered. It is evidently a remnant lying between the north end of the Hidden Treasure and the south end of the Mountain Gate. How extensive it will prove to be cannot be surmised at this time. A new *curved* drift is being driven, on a uniform gradient, to connect with the new upper level and thus dispense with the chute, which is not at all satisfactory. Thus far no trace has been found of the Red Point channel, but it is believed it will yet be found beyond the Hidden Treasure channel. The section lying in the gap between the Hidden Treasure and Mountain Gate mines has long been regarded as most puzzling, and even now it is not entirely clear. The relation of the several channels will not be definitely known until they have been practically worked out. About 200 men find constant employment here. Hidden Treasure Mining Co., of Michigan Bluff, owner; Harold T. Power, of Michigan Bluff, superintendent.

Hogsback Mine (Drift).—See our VIIIth Report, p. 472. It is 3 miles N. of Westville, at 4,850′ elevation. It has a long bedrock tunnel. Idle.

Horseshoe Bar Mine (Placer).—See our IXth Report, p. 277. It is on the Middle Fork of the American River, 2 miles S.W. of Michigan Bluff. A bedrock tunnel was driven through a spur of the ridge, just below the bar, some years since. A contract was recently let to construct 5 miles of ditch and flume from El Dorado Cañon, and delivering the water at a point 400′ above the mine. The gravel, etc., will be raised by hydraulic elevators. Horseshoe Bar Mining Co., owner; — Stevens, of Michigan Bluff, superintendent.

Huntville Consolidated (*Mosquito*) *Mine* (Quartz).—It is near the head of Mosquito Creek, 14 miles N.E. of Michigan Bluff. The vein strikes N.W., dips 70° N.E., and varies greatly in width. The developments consist of a shaft sinking to 100′ with a windlass. At 52′ from the surface a cross-cut has been driven. Besides, there is some superficial work. Five men are working. Huntville Consolidated Mining Co., owner; W. Searing, of Michigan Bluff, superintendent.

Julia Mine (Quartz).—It adjoins the Pioneer Mine, and is 1½ miles N.E. of Damascus. It is 4′ wide, strikes N., and dips 80° E. A tunnel has been driven 80′ on the vein, and a cross-cut tunnel run 700′ to the vein, and a drift has been run 60′ along the vein, giving 250′ of backs. Two men are at work. J. D. Sullivan, of Towles, owner.

Kittler Mine (Quartz).—It is 4 miles W. of Auburn, at 1,000′ elevation. The vein strikes E., and dips 45° S. A tunnel has been run 400′ on the vein, connecting with an inclined shaft 150′ to the surface. Some stoping has been done and a series of superficial cuts made along the vein for a distance of 400′, on what is presumed to be the pay-shoot. The quartz is similar to that of others in Ophir District. Some of it has been rich enough to ship to the smelters. There is no machinery on the mine. B. M. Berry et al., of Auburn, owners.

Lady Bedford Mine (Quartz).—See our XIIth Report, p. 210. It is 10 miles E. of Michigan Bluff. The mine is in successful operation, though having only a 2-stamp mill. Three men are working. Page & Buckman, of Michigan Bluff, owners.

Live Oak Mine (Drift).—See our VIIIth Report, p. 474. It is 2 miles N.W. of Forest Hill. Idle.

Lofroth Mine (Drift).—It is at Deadwood, worked in a small way by the two owners. Lofroth & Meyers, of Deadwood, owners.

Lost Camp Mine (Hydraulic and Drift).—It is 1½ miles S.E. of Blue Cañon, at 4,500′ elevation, and comprises 600 acres on an ancient channel with a N.W. course and averaging 500′ in width. The gravel is 120′ deep and is hydraulicked. A 300′ tunnel runs through slate bedrock into the gravel, which carries quartz and coarse gold. Three hundred miner's inches of free water are obtained for three or four months in the year from Blue Cañon, through a 2-mile ditch, and delivered to a giant with 4″ nozzle, under 200′ head. The tail flume is 200′ long, 3′ wide, paved with block riffles, and dumps into Woods Ravine, where there is a log and brush dam 60′ long and 25′ high. When drifting the gravel is breasted 6′ high and 12′ to 20′ wide, yielding 6 cars of ½ ton each to the breaster, per shift. The breasts are timbered with sets, and the 60% of bowlders are stored in the mine. The dirt is washed through 150′ of 18″ flume set on a 6″ grade, and paved with blocks; it is cleaned once a week. Four men are employed. J. Rathborn et al., of Blue Cañon, owners.

Lundquist Mine (Quartz).—It is a prospect in Auburn Ravine, 2 miles S.W. of Auburn. Idle. Mrs. Lundquist, of Auburn, owner.

Lynn Mine (Quartz).—See Pioneer.

Malmsberg Mine (Quartz).—It is 2 miles S.W. of Auburn, at the foot of Baltimore Ravine. A tunnel has been run on the vein a few feet, and two shafts, 50′ and 60′ deep, respectively, sunk on it. A 5-stamp mill is in process of construction. Johnas Malmsberg, of Auburn, owner.

Mammoth Bar Mine (Placer).—See our IXth, Xth, and XIIth Reports, pp. 280, 417, and 210. It is on the Middle Fork of American River, 5 miles E. of Auburn. It is worked by hydraulic elevators, and was one of the first mines in the State to successfully apply this method of mining. Since our last Report part of the head of water has been utilized to run a dynamo, furnishing ample light for working nights. Col. Davis, of Auburn, owner.

Manhattan Mine (Drift).—See Weske.

Marguerite Mine (Quartz).—See our XIIth Report, p. 210. It 1¼ miles N. of Auburn, at 1,360′ elevation. The vein strikes N.W. and dips 80° S.W. The shaft is now 310′ deep. The quartz contains a considerable quantity of mariposite, an uncommon occurrence in this district. The surface plant consists of a steam hoist and a gasoline-engine to run a 4″ jackhead pump. There is no mill. Nine men are working. Marguerite Gold Mining and Milling Co., of San Francisco, owner; Fred Deetkin, of Auburn, superintendent.

Mayflower Mine (Drift).—See our VIIIth, IXth, Xth, and XIIth Reports, pp. 457, 29-120, 453, and 210. It is 1½ miles N. of Forest Hill, at 2,700′ elevation. The Orono channel, which crosses the Paragon and Mayflower mines, is at present furnishing the principal supply of gravel now being worked. Several bore-holes and a shaft sunk in the Mayflower have determined the upper lead to be continuous and gold-bearing. There is about two miles of this lead comparatively unexplored, and it is believed it can all be worked to a profit. This will give a new lease of life to this famous mine. The underground workings of the Mayflower and Paragon have been connected, and now form a continuous exposure on the channel 4½ miles in length. The surface equipment consists of a 20-stamp water-power mill, crushing 160 tons per day, using a ¼″ screen. Ninety men are employed. Mayflower Gravel Mining Co., of San Francisco, owner; A. D. Gassaway, of Forest Hill, superintendent.

Monumental and East Fork Mine (Drift).—It is 4 miles E. of Emigrant Gap, at 4,725′ elevation, and comprises 160 acres. The workings are on the old Monumental channel, which has a general N.E. course, and is capped with pipe-clay. Shallow shafts are sunk on both claims, 25′ and 10′ deep, near the banks of the creek, requiring the placing of an ejector. As soon as the water is brought under control a drift will be started over to the channel. The claim lies on the flank of Texas Hill, and carries heavy wash, much water, and coarse, nuggety gold. Six men are employed. Dr. J. Manson et al., of Towles, owners.

Moody Ridge Mine (Drift).—It is 2 miles E. of Gold Run, at 3,650′ elevation, and comprises 120 acres of patented ground. A bedrock tunnel is being run, through diabase, to tap a channel supposed to have a N.E. course; it is now 45′ in length, and will have to be extended 60′ to cut through the rim. R. Brown and J. J. Speikel, of San Francisco, are working under a bond. Moody Bros., of Gold Run, owners.

Moore Mine (Quartz).—It is in Ophir District, 2 miles S.W. of Auburn, at 1,050′ elevation. The vein strikes E. and W., and dips 45° S. The pay-shoot, however, tends eastward along the vein, and the 300′ shaft is sunk with the pitch of the shoot—a most unusual thing. The quartz is crystallized, and contains gold and auriferous sulphides of iron, copper, lead, and zinc. There is a steam hoist, but no mill. Four men are at work. White & Thorp, of Ophir, owners; J. W. White, of Ophir, superintendent.

Morning Star Mine (Drift).—See our VIIIth, IXth, Xth, and XIIth Reports, pp. 472, 29, 420, and 211. It is at Iowa Hill, at 3,000′ elevation. The mine is working steadily, under the same favorable conditions as have obtained for years. The mill has 10 stamps, furnished with both steam and water power. Sixty men are employed. Morning Star Mining Co., of Colfax, owner; Hon. J. H. Neff, of Colfax, superintendent.

Mosquito Mine (Quartz).—See Huntville Consolidated.

Mountain Gate Mine (Drift).—See our VIIIth and IXth Reports, pp. 468 and 29. See Hidden Treasure.

New Baccarat Gravel Mine (Drift).—It is on leased ground, 3 miles

S.E. of Lincoln, in Sec. 23, T. 12 N., R. 6 E., at about 160′ altitude. Ten prospect shafts, 4′ to 5′ in diameter and 25′ to 80′ deep, have been sunk to bedrock, and two drifts, 150′ and 175′ long, have been run. Water from the South Yuba ditch will be used. Four men are employed in developing. J. I. Felter, of Sacramento, secretary; A. V. Oliver, of Lincoln, superintendent.

No Chunk Mine (Quartz).—It is a prospect, ½ mile W. of Michigan Bluff. The decomposed country rock and quartz have been sluiced off on the surface. Two men are at work. G. E. Hill et al., of Michigan Bluff, owners.

Number Two Mine (Quartz).—It is 3½ miles S. of Gold Run, at 2,875′ elevation. The vein strikes N. and S., and dips E. between slate and porphyry, and is 12′ wide, carrying two parallel stringers. There is an 80′ tunnel, giving 60′ of backs, and a shaft 40′ deep on the vein. Only assessment work is being done. Moody & Gayety, of Gold Run, owners.

Old Pacific Mine (Quartz).—See our XIIth Report, p. 211. It is in Ophir District, 4½ miles W. of Auburn. Idle. D. Schnabel, of Newcastle, owner.

Ophir District.—See our Xth Report, p. 427. The mines of the district are fissures, in grano-diorite, diabase, and serpentine. The ores of the district have long been called refractory, though their physical appearance suggests a simple process of amalgamation and concentration, and, indeed, very good work is now being done at several mills in the district, proving this to be true. A large amount of money has been expended on processes, machinery, furnaces, etc., all of which are unnecessary. The gangue is quartz containing sulphides of iron, lead, zinc, copper, and, more rarely, gray copper (tetrahedrite). There has been a general revival of mining in Ophir District, and nearly all the mines of prominence are again at work, after an idleness of many years.

Oro Mine (Drift).—It is 2½ miles N.E. of Michigan Bluff. A tunnel run 4,000′ into the hill years ago has been bulkheaded, and is now used as a reservoir for water. Idle. Mrs. A. Dixon et al., of Michigan Bluff, owners.

Osborne Mine (Quartz).—See Herman.

Paragon Mine (Drift).—See Breece & Wheeler.

Pioneer Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 468 and 211. This property includes the *Lynn* and *Pioneer* mines. It is 1 mile N.W. of Damascus, at 3,800′ elevation. There are two veins 900′ apart, and approximately parallel. The strike is a little E. of N., and the dip 80° E. The mine is opened by three cross-cut tunnels, the main or lower tunnel being 1,400′ long. On this level the main drift is 2,500′ in length. There are several hundred feet of ground open on each tunnel level, and considerable stoping has been done. Five hundred and twenty feet below the present main cross-cut, a new tunnel is being driven to the vein, under contract. A hoisting plant has been set up in the station on the main tunnel level, and a winze is now being sunk to the 1,000′ level, to connect, by means of a drift, with the new cross-cut now being driven. The quartz is sent in cars on a 2,700′ tramway to the mill, 1,100′ below. The 20-stamp mill, of 850 lbs. each, is supplied with eight Frue vanners and a canvas table of 800 sq. ft. of surface. From 35 to 200 inches of water from Damascus Cañon—according to season—is carried in the company's ditch, 2 miles in length, and delivered at the mill under 65′ pressure. Forty men are employed. Pioneer Gold

Mining Co., of Boston, Mass., owner; J. D. Sullivan, of Towles, superintendent.

Red Point Mine (Drift).—See Golden River.

Red Rock Mine (Quartz).—It is 2 miles S.E. of Blue Cañon, at 4,450′ elevation, and contains 160 acres. The vein strikes N. 25° E., and dips 37° S.W., varying in width from 5′ to 12′ between slate walls, in a porphyry belt, intersected with quartz seams. Tunnel No. 1 cross-cuts 220′ through the slate, and turns 200′ S. on the vein and 50′ N., where some stoping has been done. Former owners worked out a large open cut on the outcrop of the vein. A new 10-stamp water-power mill, furnished with two Union concentrators, has just been completed, but is not yet running. Free water from the north branch of North Fork of the American River is delivered through 540′ of 11″ pipe to a 4′ Pelton wheel, under 290′ pressure. An incorporated company, of Philadelphia, owner; Governor N. B. Willey, of Blue Cañon, superintendent.

Rising Sun Mine (Quartz).—See our VIIIth Report, p. 462. It is 1 mile N.W. of Colfax, at 2,290′ elevation. Idle, on account of litigation.

Sailor Cañon Mine (Drift).—See our Xth Report, p. 426. The tunnel started some years since has reached gravel, and 3 or 4 men are at work in the mine. It has not been extensively opened as yet. Sailor Cañon Gravel Mining Co., of San Francisco, owner; — Denton, of Westville, superintendent.

Salsic (*Smith & Fulweiler*) *Mine* (Quartz).—See our XIIth Report, p. 212. It is a prospect, ¾ mile N.W. of Auburn. Two men are at work. Smith & Fulweiler, of Auburn, owners.

Secret Town Mine (Quartz).—It is 3 miles S. of Gold Run, at 2,875′ elevation. The 2′ vein strikes N.W. and dips 60° N.E. in a slate formation. There are two shafts, 35′ and 40′ deep, respectively, and a 20′ tunnel that ultimately will cut the vein at 150′ depth. Only assessment work done. Moody & Gayety, of Gold Run, owners.

Sellier Mine (Drift).—It is 2½ miles N.E. of Michigan Bluff. A tunnel is being driven to reach a channel under the Forest Hill Divide. J. B. Sellier, of Michigan Bluff, owner.

Shaw Bros.' Mine (Drift).—It is ½ mile S. of Alta, at 3,500′ elevation, and comprises 500′ on the Alta channel. A bedrock tunnel has been driven 300′ in rotten granite, and continued 60′ in gravel, which is from 3′ to 4′ high, with a pipe-clay capping. The quartz gravel is cemented. From 8 to 10 carloads (1,500 lbs.) of gravel are extracted per shift, with 2 men at work. The gravel is washed, with tunnel water, through six 14″ boxes furnished with Hungarian riffles. Shaw Bros., of Alta, owners.

Shivley (*Big Gun*) *Mine* (Hydraulic).—It is at Michigan Bluff. There are still a few remnants of the once great channel on the point below Michigan Bluff which are to be hydraulicked, permission having been granted by the Debris Commission. The owners have been engaged for some time in cleaning out old bedrock tunnels and flumes, and making other necessary preparations. The debris will be discharged into Dutch Gulch. Six men are at work. Powell Bros., of Michigan Bluff, owners.

Small Hope Mine (Drift).—See our XIIth Report, p. 212. It is 3½ miles N. of Forest Hill, and is worked in a small way by the owners. W. D. Craneage et al., of Forest Hill, owners.

Southern Cross Mine (Quartz).—See our XIIth Report, p. 212. It is near the North Fork of the American River, 4 miles N.W. of Damascus. The vein strikes N. 12° W., and dips 60° E. Idle. E. Ford, of Towles, owner.

Southern Cross and Polar Star Mine (Drift and Placer).—It is in Dutch Flat, at 3,100′ elevation, and comprises 140 acres. This was formerly a hydraulic mine. At present the company is drifting at different points on the Polar Star under the gravel bank, which is 160′ high. The tunnel is 300′ long, and the gravel carries 80% of bowlders, which are largely left underground. The breasts are carried 7′ high, 40′ wide, and timbered with post and cap. Seven men are employed. J. Spaulding, of Auburn, owner; W. T. Garrett, of Dutch Flat, superintendent.

Spanish Mine (Quartz).—It is 3½ miles W. of Auburn, at 1,050′ elevation. There is a shaft and a tunnel on the mine, both caved and inaccessible; the former is said to be 200′ deep. A new cross-cut tunnel is now being driven to the vein by 2 men. C. A. Reed, of Ophir, owner.

St. George Mine (Drift).—It is ¼ mile S. of Yankee Jim's, at 2,700′ elevation. It is worked by two lessees. Charles Mason, of San Francisco, owner.

St. Lawrence Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 461 and 212. It is 3½ miles W. of Auburn, at 1,000′ elevation. The vein has a general strike of N. 70° W., and dips 30° to 45° S.W. The vein ranges from 6″ to 3½′ in width. There are two tunnels on the vein, the upper one being 650′ and the lower one 350′ in length. A shaft connects the upper tunnel with the surface. A 3′ Huntington mill on the property is also used for custom work. Four men are working. C. A. Reed, of Ophir, owner.

Texas Mine (Quartz).—It is 4 miles S. from Emigrant Gap, at 5,600′ elevation, and comprises 3,000′ on the vein. The vein courses N. and S., and dips 60° E., in slate, averaging 3′ in width. A tunnel cross-cuts 200′ to the vein and continues for 100′ on the same, giving 100′ of backs. The quartz is well mineralized, carrying iron sulphurets. There is also a shaft 110′ deep on the vein. Idle. Halsey Estate, of Towles, owner.

Three Stars Mine (Quartz).—See Columbia Gold and Silver Mining Co.

Truro Mine (Drift).—It is on Ford's Bar, on the American River, at 1,000′ elevation. A bedrock tunnel, at present 350′ long, is being driven to strike a former channel. An incorporated company, owner; S. C. Jordan, of Gold Run, superintendent.

Washington Mine (Drift).—It is at Deadwood. The mine is being cleaned out, after a long idleness, and the tunnel is to be extended, under contract, to the channel, which it is thought will be reached in 800′ more. Two men are at work. — Whitney et al., of Nevada City, owners.

Watt Mine (Drift).—It is 2 miles E. of Iowa Hill, and is worked by 4 men. Watt Bros., of Iowa Hill, owners.

Weske Mine (Drift).—See our Xth and XIIth Reports, pp. 441 and 213. It is 1½ miles N.E. of Michigan Bluff, and includes the *Manhattan*, which is a separate channel. The mine was formerly worked extensively and was completely equipped, having a locomotive for hauling trains of cars in and out of the mine, etc. The surface plant is rapidly falling into decay. The mine is now worked by lessees, who are operating on both the Manhattan and Weske channels. The latter is known in the Paragon and Mayflower mines as the *Orono* channel. Eight men are at work. James Muir, of Michigan Bluff, owner.

Wild Yankee (*Blue Bluff*) *Mine* (Drift).—It is 3½ miles E. of Shady Run, at 3,800′ elevation. This property has been converted from a hydraulic, but the owners have been placering a bank of quartz gravel 50′ high with water taken from the Cedar Creek ditch. The tail-flume dumps into Shady Run Cañon. Idle. C. Oak et al., of Towles, owners.

Tailings Works of the Alturas Mine.

MILLS IN PLACER COUNTY.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of Each, in Lbs.	Capacity per 24 Hrs., in Tons.	Concentrators.	
					No.	Character.
American Bar	Water	10	850			
Big Dipper	S. & W.	10	950			
Black Oak	Steam	5	850	10		
Bowlder	Water	8	750		1	Johnston.
Breece & Wheeler	Steam	10	800			
Buttes		5				
Dahlonega	Steam	8	850			
Dardanelles	S. & W.	5		40		
Dorrer		10	850			
Eclipse	Water	10	850			
Gold Blossom (1)		10				
Gold Blossom (2)	Water	10	950			
Golden Shaft	Water	8	950	56		
Gold Ring	Water	10	850	40		
Gray Eagle	Steam	10				
Hathaway	Water	20			4	Johnston.
Herman	Steam	10	1,000		4	U. I. Works.
Kidd & Johnson	Water	5	650			
Lady Bedford		2				
Malmsberg		5				
Mayflower	Water	20		160		
Morning Star	S. & W.	10				
New Mill		5				
Pioneer	Water	20	825		8	Frue.
Red Rock	Water	10			2	Union.
Shipley		10				
St. Patrick	Water	15	750	22		

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN PLACER COUNTY.

Name of Mill or Mine.	Power.	Number	Character.	Diameter	Capacity per 24 Hrs., in Tons.	Concentrators.	
						No.	Character
Bells	Water		Kendall				
Drummond		2	Huntington				
Jamison	Water		Arrastra				
St. Lawrence		1	Huntington	3′		1	Johnston.
Three Stars	Water		Huntington				

Plumas County.

Alameda Mine (Quartz).—See Florence Consolidated.

Altoona Mine (Quartz).—See our Xth and XIIth Reports, pp. 472 and 213. It is situated in Sec. 23, T. 36 N., R. 9 E., on the divide between Round and Indian valleys, 1½ miles S.W. from Crescent Mills, at 5,000′ elevation. The location is 1,500′ by 600′, and the vein courses N. 65° W., with a granitic foot-wall. Since our last Report very little work has been done, and the mine is now idle. Judge Emmons, of Greenville, owner.

Alturas Mine (Placer).—See our XIth and XIIth Reports, pp. 332 and 213. It is on Slate Creek, 3 miles S.E. of La Porte, and consists of 5½ miles on the bed of Slate Creek, with an average depth of 20′ of tailings. Bedrock cuts are run to straighten the channel and gain grade, and the spring freshets are utilized for concentrating the material, which is washed through flumes set on a 6″ grade and supplied with Hungarian riffles. Twenty-five men are employed. — Packer and C. Hendel, of La Porte, owners.

Arcadian Mine (Quartz).—See Round Valley M. Co.

Bear Mine (Quartz).—See our XIIth Report, p. 213. This property is 14 miles S. of Prattville. Idle. F. C. Mandeville, of Butte Valley, superintendent.

Bell Mine (Quartz).—See Dubuque.

Beckwith Consolidated Mine (Quartz).—See our XIIth Report, p. 213. Idle. E. McNeil et al., of Beckwith, owners.

Blackhawk Mine (Quartz).—See Bushman & Orr.

Blackhawk Mine (Placer).—See Musick & Schaefer.

Black Oak Mine (Quartz).—It is 6 miles W. from Quincy, at 3,400′ elevation. Two claims have been located on a vein which courses N.W. and S.E., and are designated as the *Black Oak* and the *White Oak* claims. There are two tunnels; the main one, 400′ in length, has been extended during the last year, and a new one started near the north end. An arrastra has been placed near the north end of the claim, and is run by a 20″ Gould water-wheel, requiring 17 miner's inches of water under 70′ pressure, which is taken from a neighboring ravine. Two men are at work. H. P. Wormley, of Quincy, owner.

Blind Lode Mine (Quartz).—See our Xth and XIIth Reports, pp. 475 and 213. It is on Wolf Creek, 6 miles S.W. from Greenville. Idle. D. McIntyre, of Greenville, owner.

Blue Point Mine (Quartz).—See Butterfly.

Brant Point (*Keystone*) *Mine* (Quartz).—It is 12 miles N.W. of Quincy, at 5,600′ elevation, and consists of a 1,500′ by 600′ location. The 4′ vein trends N.W. and S.E., and dips N.E., between greenstone walls. This is an abandoned mine, which is being rehabilitated. The old tunnel, 400′ long, with an incline at the end, has been cleaned out, and the incline is being sunk deeper. Three men are at work. G. Brant, of Quincy, owner.

Brooks Mine (Quartz).—See Duncan.

Brown Bear Mine (Quartz).—See Mountain King.

Bushman & Orr (*Blackhawk*) *Mine* (Quartz).—See our XIth and XIIth Reports, pp. 328 and 214. It is in Blackhawk Ravine, at the mouth of Eliza's Fork, at 3,350′ elevation. Idle. Musick & Schaefer, of Quincy, owners.

Butte Mine (Quartz).—See Mountain King.

Butterfly Mine (Quartz).—See our XIIth Report, p. 214. It is 6 miles N.W. of Quincy, at 3,375′ elevation. The property comprises four locations and a fraction with two parallel veins, known as the *Governor* and *Blue Point*, which start with an east dip and then reverse. The Governor vein is 7′ wide and carries 5% of sulphurets; the Blue Point is 9′ to 16′ wide; both are encased in slate. On the Blue Point is a cross-cut tunnel 70′ to the vein, and 60′ above on the surface is a shaft 50′ deep. On the Governor is a 50′ shaft, with a 70′ drift (to the north) from the bottom, showing a 7′ vein in the face; also, a 56′ cross-cut tunnel to the vein 200′ lower, with 30′ turned on the vein, which is 5′ wide. There is a 10-stamp steam-power mill, with 80 H.P. boiler, 800-lb. stamps, old-style Frue vanners, and a Gold King amalgamator. Sixty miner's inches of water, under 200′ pressure, may be had by building a 2-mile ditch from Butterfly Creek. Eighteen men are generally employed. Thompson & Kellogg, of Spanish Ranch, and A. Smith, of Quincy, owners.

Byers Mine (Quartz).—See Halsted.

Cahalan Mine (Quartz).—It is situated about 1½ miles N.W. of Crescent Mills, at 3,900′ elevation, and consists of a patented claim, 500′ by 600′. The vein is over 12′ wide and low-grade; trends N.W. and S.E., and dips nearly vertically. It is well adapted for economical working, being convenient to water-power, well supplied with fine mining timber, and may be opened by tunnels on the vein to a depth of six or seven hundred feet. Three tunnels have been driven; the longest is over 500′ on the vein. Idle. Dr. Carter, of Crescent Mills, owner.

California (A. C. Light's) Mines Nos. 1, 2, 3, and 4 (Quartz).—These are 1½ miles S.W. of Taylorsville, at 4,600′ elevation. Two of the claims are located on a "pocket" vein, 2″ to 6″ in granite, which trends N.W. The other two claims are on a very heavy outcrop of low-grade quartz, showing very few sulphurets, and trending E. and W. and dipping N. While a number of tunnels have been driven on the seam locations, but little development has been done on the larger outcrop. One man is at work. A. C. Light, of Taylorsville, owner.

California Gold Mining and Investment Co.'s (Taylor Diggings) Mine (Hydraulic).—This property is situated in Genesee Valley, 3 miles N.W. from Genesee, at 5,500′ elevation, and comprises 200 acres along an ancient channel with from 4′ to 60′ of gravel, carrying fine gold throughout. It is being put in condition, so as to commence washing the coming season. Water will be obtained from Taylor Lake, and from near the head of Davis Creek, through a ditch in course of construction, which will be 12 miles long and 3′ wide on bottom and 3′ deep; 6 miles have been completed. Two giants are to be used, under 150′ pressure. No derrick will be required. Eleven men are at work. An incorporated company, of Chicago, Ill., owner; J. F. Clapp, of Genesee, superintendent.

Calliope Mine (Placer).—It is 4 miles E. of Butte Valley, on a bar of the North Fork of Feather River, at 3,425′ elevation. The claim contains 20 acres. The pit is about 60′ wide, with a 10′ bank of gravel, which contains over 50% of large bowlders and cobbles; coarse gold, partially black, is scattered throughout. A derrick with 40′ boom, run by a 9′ overshot wheel, hoisting 50 tubs of gravel per shift, is used. A Chinese pump, 18″x 30′, is run by an 8½′ overshot wheel, with 4½′ breast. The gravel is washed through 20 boxes, 14″ wide, set on a grade of 1′ to the box, and furnished with pole riffles. The season lasts five months. Seven men are employed. H. L. White & Son, of Butte Valley, owners.

Cameron Mine (Drift).—It is 3 miles S.E. from Butte Valley, on the North Fork of Feather River, at 3,400′ elevation, and contains 80 acres on an ancient channel following a northeast course under what is known as the Big Flat. A 780′ bedrock tunnel, of which 560′ is in rim rock, reaches a point 30′ below the channel and is connected with it through an upraise. The gravel and lava capping is 600′ deep, and the gravel in the channel is breasted out 6′ high and 40′ wide and timbered with post and cap; it carries about 60% of bowlders and cobbles, with coarse gold. A breaster can take down three carloads of 1,500 lbs. each, per shift, which yield from $2 to $4 per carload. Eighty feet of the channel upstream has been worked. The gravel is washed with the mine water through 4 boxes, 12″ wide, with 14″ grade per 16′, and furnished with Hungarian riffles. Three men are employed. Angus Cameron, of Butte Valley, owner.

Cascade Mine (Hydraulic).—It is 10 miles S. from Genesee, at 5,900′ elevation, and contains 160 acres. The bank is 120′ high, and all gravel; the pit is 250′ across the face and carries fine gold throughout; it is said that, as the work has progressed up the channel, the value per cubic yard has gradually increased from 13 cents to 20 cents. A hand-derrick, with 90′ mast and 50′ boom, is used. Water is obtained from Clear Creek through ditches 3½′ wide; the north ditch has a grade of 2½″ per rod and the south ditch 1½″ per rod, the combined capacity being 800 miner's inches. The water season is about ninety days, but a reservoir under construction at Lovejoy's ranch will extend it to eight months. Two No. 3 giants, with 4″ and 4½″ nozzles under 250′ pressure, are used, the water being conducted through 2,000′ of 11″ pipe. Eight men are employed. T. R. Walsh, of Vallejo, Solano County, owner.

Cayot Mine (Quartz).—See our XIIth Report, p. 214. It is on Fall River, 9 miles W. of La Porte, at 4,600′ elevation, and consists of five claims. Since our last Report a 215′ drift has been run northeast from the upper (30′) cross-cut tunnel, which shows a continuous pay-shoot for 200′, with a 7′ vein in the breast, and 120′ of backs. It courses N.E. and dips 70° N.W., and carries a fair percentage of sulphurets of good grade. One man is at work. F. Cayot, of La Porte, owner.

Centennial Mine (Drift).—See our XIIth Report, p. 214. It is on the North Fork of Feather River, 10 miles S. of Prattville, in T. 26 N., R. 8 E. J. S. Bransford et al., of Quincy, owners.

Centennial Mine (Drift).—See our XIth and XIIth Reports, pp. 325 and 214. This mine is 4 miles N.W. from Quincy, and shows but little development. — Challen et al., of Spanish Ranch, owners.

Centennial (*Brandt*) *Mine* (Quartz).—See our XIIth Report, p. 213. It is situated on Ward Creek, on the south side of Genesee Valley, 10 miles S.E. from Taylorsville, at 4,200′ elevation. Deane & Fletcher, of Reno, Nev., and — Moore, of Woodland, Yolo County, owners.

Chico Star Mine (Quartz).—It is 6 miles from Butte Valley, at 3,300′ elevation, and contains two claims. The 12″ vein trends N.W. and S.E., and dips 45° S.W., between slate and greenstone. The quartz carries a large percentage of high-grade sulphurets, in part arsenical. There is a cross-cut tunnel to the vein. Dunn Bros., of Butte Valley, owners.

Chip Creek Mine (Drift).—It is 20 miles N.W. from Spanish Ranch, and contains 20 acres. There is a 60′ tunnel on the bedrock, in a 12′ gravel bank, from which the breasts are carried 20′ wide and 6′ high. The percentage of bowlders is large, requiring a portion to be run out. The gold is coarse. Wash-water is taken from the neighboring ravines, through 1 mile of ditch. The gravel is washed through 60′ of 12″ flume supplied with Hungarian riffles. Two men are at work. Geyrand & Son, of Spanish Ranch, owners.

Cleveland Mine (Quartz).—It is 1 mile S.W. from Greenville, at 3,200′ elevation. The vein trends N.E. and S.W., and dips 60° S.E., between a serpentine foot-wall and a granitic hanging-wall. Two cross-cuts, a different levels, 100′ long, cut through the hanging-wall to the vein; from the upper one a 125′ drift to the southwest showed a 1′ vein with broken walls, and a 50′ drift to the northeast showed a 2′ vein. In the lower tunnel a heavy flow of water was tapped. There are two 10′ arrastra driven by 12′ horizontal wheels, with water taken out of North Cañon. Five men are employed. G. B. Cazzaglio and G. B. San Felipe, of Greenville, owners.

Concordia Mine (Hydraulic).—See Tefft & Co.'s Mine.

Consignee Mine (Drift).—See our XIth Report, p. 330. It is situated on the Middle Fork of the Feather River, about 20 miles S.E. from Quincy, at about 4,700′ elevation. A long bedrock tunnel has been run and upraises made without realizing satisfactory returns. Idle. An incorporated company, owner.

Coquette Mine (Quartz).—It is 8 miles S. from Buck, at an approximate elevation of 4,700′. It contains four locations, on different veins, three trending N.E. and S.W., and dipping about 70° S.E. They are in granitic formation, and range from 18″ to 8′ in width. A 400′ tunnel cross-cuts these veins, and on each are drifts. Considerable stoping has been done. A lower cross-cut has been started, and has attained a length of 100′. The fourth vein, designated as *El Capitan*, is about 2′ wide, trends more N. and S., and lies S.E. from the others in the slate; on it is a 60′ shaft and a 100′ tunnel. The ore is reduced in a 10-stamp water-power mill, with 750-lb. stamps. The water is obtained from Little Coquette Creek, and applied on a 6′ Knight wheel under 110′ pressure. Three men are employed. J. J. Lawrence and — Snell, of Merrimac, Butte County, owners.

County Line Mine (Quartz).—It is situated on Dean's Hill, 4 miles N.E. from Merrimac, Butte County, at about 4,700′ elevation. The 2′ vein trends N.E., and dips S.E. between slate and porphyry. A 40′ shaft has been sunk on the vein, and two tunnels driven, each about 100′ in length. Two men are at work. W. B. Harbin, of Merrimac, Butte County, owner.

Crescent Mill and Mining Co.'s Mine (Quartz).—See our VIIIth, Xth, XIth, and XIIth Reports, pp. 481, 469, 330, and 214. The mine is situated in Sec. 24, T. 26 N., R. 9 E., near Crescent, Indian Valley, at about 3,700′ elevation, and the 1,500′ by 800′ location embraces the *Crescent Pet*, *Horseshoe*, *Lee*, and *Ophir* veins. Worked to a depth of 400′, and the ore too low-grade to pay. Part of the mill is run on custom rock, and also on that from the old waste-dumps. A. W. Whitney, of Crescent, superintendent.

Crescent Pet (Quartz).—See Crescent Mill and Mining Co.

Cub Mine (Quartz).—See our XIIth Report, p. 214. It is situated in T. 23 N., R. 8 E., 14 miles from Prattville. Idle. Cub Mining Co., of Butte Valley, owner; F. C. Mandeville, superintendent.

Diadem (*Edman*) *Mine* (Quartz).—See our Xth, XIth, and XIIth Reports, pp. 486, 323, and 214. It is situated on Mulmford Hill, 2 miles S.W. from Meadow Valley, at about 5,000′ elevation. Since our last Report little or no development has been done; part of the mine has been retimbered. — Edman et al., of Meadow Valley, owners.

Ding Dong (*Rattlesnake*) *Mine* (Drift).—It is on Gamblers' Ravine, 4 miles N. of Quincy, at 3,450′ elevation, and comprises 100 acres. This claim is on what is known as the Western channel; it has been proven to be 60′ wide, and carries coarse gold. The gravel, from 1′ to 6′ deep, is easy picking, and contains heavy bowlders. Above the gravel is 6′ of pipe-clay and 75′ of lava. At the end of the 280′ bedrock tunnel is a 16′ upraise into gravel, and thence a 70′ drift along the rim. Higher up is a second tunnel, 130′ long. An air-shaft 96′ deep has been sunk to the gravel on the back rim. The gravel breasts are worked 5′ high and 10′ wide, timbered with full sets. A quartz ledge, 2½′ wide, runs across the slate bedrock and has been sunk on about 10′, showing a $5 per ton prospect in the horn-spoon. Water for washing is obtained from Little Blackhawk, as well as from the Quincy Water Co.'s ditch. Two men are employed. J. Lowrey et al., of Quincy, owners.

Drury and Pacific Mine (Quartz).—See McGill and Standard.

Dubuque (*Bell*) *Mine* (Quartz).—See our Xth Report, p. 478. Idle.

Dude Mine (Quartz).—See Duncan's.

Duncan's Mines (Quartz).—They are situated on the N. side of the east branch of the North Fork of Feather River, at the mouth of Rush Creek, at 2,650′ to 3,100′ elevation, and consist of the *Ohio Point* (1,340′ by 600′), the *Dude* (931′ by 600′), and the *Brooks* (1,371′ by 600′). Their course is N. 43° W., and dip 55° S.W. The first two are contiguous to the river and are twice cut by it to a depth of 22′, exposing an outcropping body of quartz about 700′ long and 78′ wide. Few developments have been made. The property includes a mill site and a 3-mile ditch with a capacity of 1,200 miner's inches, diverted from Rush Creek, giving 420′ pressure at the mill site. W. C. Duncan, of Oroville, Butte County, owner.

Dutch Hill (*North Fork Hydraulic Mining Co.'s*) *Mine* (Drift).—See our VIIIth and XIIth Reports, pp. 482 and 215. It is 7 miles S.E. from Prattville, at approximately 4,500′ elevation. Since our last Report the Logan tunnel has been extended to 1,100′, of which 300′ were run the past year. From 4 to 6 men are employed. Savercool Bros., of Butte Valley, and F. Miller, of Sacramento, owners.

Edman Mine (Quartz).—See Diadem.

Elizabethtown Gravel Channel Mining Co.'s (*Riverdale*) *Mine* (Drift). See our Xth and XIIth Reports, pp. 478 and 215. It is ½ mile N.E. of Quincy, at 3,325′ elevation. Since our last Report the property has been bonded to parties from San José, who are sinking a double-compartment shaft, which is 35′ deep. Eight men are employed. W. W. Kellogg, of Quincy, owner.

Ella Mine (Quartz).—It is 6 miles N.E. from Merrimac, Butte County, at 4,800′ elevation. The vein is about 20″ wide, courses N.E., and dips nearly vertically (slightly south) in granite. Several tunnels have been driven to the ledge, the longest of which is 320′, giving 90′ of backs. Stringers of gold-bearing quartz extend for a distance of 3′ to 4′ into the foot-wall. The quartz carries 1½% of high-grade galena, arsenical and iron sulphurets. Four men are employed. J. A. Hall, of Merrimac, Butte County, owner.

Emerson & McMullin Mine (Drift and Placer).—It is on Grizzly Creek, 6 miles S. from Genesee, at 5,150′ elevation, and comprises 80 acres on a break from a former bench of Grizzly Creek. The open cut is 40′x 18′. Two derricks are used: one a small hand-power, and the other a water-power, with 50′ mast and 40′ boom, operated by a 7′ wheel with 3′ breast. The 200 miner's inches of water are diverted from Grizzly Creek through a ditch ¼ mile long, and can be delivered under 150′ pressure if required. The gravel, which contains numerous large bowlders, with coarse-washed gold on the bedrock, is washed through 700′ of 12″ flume, set on a grade of 5½″ to 12′, furnished with pole riffles, the upper boxes of which are cleaned up every two weeks during the eight months' water season. Three men are employed. A. Joseph, of Genesee, owner.

Emigrant Hill Mine (Hydraulic).—See Plumas-Imperial.

Emigrant Mine (Drift).—See our XIIth Report, p. 215. It is 2½ miles N. of Quincy, at 3,375′ elevation, and comprises 80 acres. R. Bell, of Quincy, owner.

Fall River Consolidated Mine (Quartz).—See our XIIth Report, p. 216. It is on Fall River, 9 miles W. from La Porte, at 4,500′ elevation, and consists of two locations. Since our last Report a third ore-shoot has been cut near the surface south of the main workings, and the drifts in the main workings have been extended on the course of the vein; the main cross-cut is also being driven to reach the third vein, about 80′ ahead. The 5-stamp water-power mill runs intermittently. Two men are employed. J. C. Wolters et al., of Gibsonville, owners.

Florence Consolidated Mine (Quartz).—It is near the junction of Coquette and Cold Water creeks, 3½ miles E. of Merrimac, Butte County, at an elevation of 4,700′. It comprises three claims: the *Alameda*, *Lily*, and *Florence*, which course N.E. and dip S.E., between porphyry and slate walls. The vein is from 4′ to 6′ in width, and carries a small percentage of sulphurets and free gold. The developments consist of a 30′ shaft on the vein and a tunnel intended to cut the vein about 50′ below the surface; another tunnel run on the vein in the Alameda shows a 5′ vein in the breast. The mill site is situated in the forks of the two creeks, which furnish permanent water-power. Excellent timber is at hand. Two men are at work. E. C. Robinson, of Merrimac, Butte County, owner.

Four Hills Mine (Quartz).—It is 6 miles in a S.W. direction from Johnsville, at 7,150′ elevation, on the border between Plumas and Sierra counties. It comprises seven locations on a vein, from 2′ to 20′ wide, which trends N.W. and S.E., and dips from 40° to 70° S.W., between metamorphic slate and syenite. The quartz, though low-grade, has produced some phenomenally rich shoots, which have been followed in the development of the mine, leaving large reserves of low-grade ores available. After a period of idleness the mine has been reopened, new buildings erected, and a lower tunnel started, at 6,925′ elevation. The new lower tunnel to date of writing had acquired a length of 40′, in which it gained a foot in depth for every foot ahead. The former main tunnel, known as the Mexican, is 150′ in length and cross-cuts the lode, on which are two drifts, about 1,000′ to the S.E. and about 300′ to the N.W. There is an old, dilapidated 10-stamp mill on the ground. Twelve men are employed. Four Hills Mining Co., of San Francisco, owner; Ogden Hoffman, of Johnsville, Plumas County, superintendent.

Franklin Mine (Drift).—See Gladiator.

Franklin Consolidated Mine (Drift).—See our XIIth Report, p. 216. It is 5 miles W. of Poker Flat, and contains 480 acres. D. McFarlane et al., of Beckwith, owners.

Frazier Mine (Quartz).—It is 6 miles N.E. of Merrimac, Butte County, at 4,775′ elevation. The location contains three parallel veins up to 2½′ in width, with a N. of E. course, and nearly vertical dip, in granite country rock. The ore carries a large percentage of high-grade sulphurets, which are saved and shipped. The developments consist of a 500′ cross-cut tunnel 200′ to the first, thence 240′ to the second, and thence 60′ to the third, vein. The first two veins have been drifted upon about 100′ S., while the third has been drifted on 30′ N. and 70′ S. An air-shaft connects with the cross-cut. At the mouth of the cross-cut is a 6′ Huntington roller mill and Triumph cencentrator, driven by a steam-engine with 8″x 14″ cylinder, consuming 1¼ cords of wood per day. Fourteen men are employed. An incorporated company, of San Francisco, owners; T. W. Finchley, of Merrimac, Butte County, manager.

Gallagher Mines (Quartz).—They are 4 miles N. of Johnsville, on the head of Bear Creek, at 6,250′ elevation, and comprise six claims on three parallel veins. The veins, with a width of 2′ in the present developments, trend N. and S., and dip slightly to the east. The formation is metamorphic slate and syenite. There are several tunnels of considerable extent, closed by caving at the mouth; the present working tunnel cuts the veins at a depth of 132′. There is an 8-stamp water-power mill, with 650-lb. stamps, half of which are running on one shift, crushing 4 tons daily. The power is developed by a 4½′ Pelton wheel, from water derived from the Indian ditch, which heads in Bear and Squirrel creeks, using mostly snow-water. Two men do all the work. Gallagher Bros., of Johnsville, owners.

Garfield Flat Mine (Hydraulic).—It lies 4 miles in a N.E. direction from Johnsville, at 5,500′ elevation, and contains 180 acres. The gravel bank averages only 10′ in height, and the pit is about 300′ wide. No derricks are required. The water is brought from Bear Creek through a ditch ½ mile long, 2′ on the bottom and 3′ deep, ending in two reservoirs; one No. 3 giant with 3″ and 5″ nozzles, under 100′ pressure, can pipe for three hours per day, the reservoirs emptying in three quarters of an hour. The pipe-line is 800′ in length, reducing from 18″ to 11″. The flume is 1,100′ long, 2′ wide, set on a 4½″ and 6″ grade, and paved with 6″ blocks. The dump is in a dry ravine, emptying into Squirrel Creek, along which are four restraining dams. The first is 16′ high, built of logs and brush; the second is 8′ high, also of logs and brush; the third 7′, and the fourth 12′. There is ½ mile distance between the first two dams. Three men are employed. P. Lorenzi, of Johnsville, owner.

General Harrison Mine (Drift).—See our XIIth Report, p. 216. It is situated 9½ miles N.E. of Gibsonville, at 5,400′ elevation. C. H. Radcovich, of Johnsville, owner.

Genesee Valley (*Ward*) *Mine* (Quartz).—See our Xth Report, p. 476. It is situated on Ward Creek, about 3 miles S. from Genesee, at 4,100′ elevation, and consists of a quartz location and 20 acres of placer ground. The vein trends N.W. and S.E., with a somewhat varying dip, averaging 50° S.W., inclosed in a much-folded slate rock. The present principal workings are carried on through a double-compartment 4′x 8′ shaft back of the mill and at a sufficient height above it to permit of the ore being at once run to the mill. Near the bottom, drifts extend 300′ S. and 150′ N., along the vein. An 8″ jackhead pump, running twelve hours per day, keeps the works dry. The vein makes in swells, attaining a width of 5′, and carries a large percentage of black oxide of manganese that is frequently intimately mixed with fine free gold. In the lower works, and underneath the vein, quartz has been cut carrying gold and a large percentage of sulphide and carbonates of copper. Southeast of the shaft is a tunnel, driven on the vein, from which a 65′ incline has been sunk, disclosing a 5′ body of quartz, on which considerable stoping has been done. North of the shaft is another tunnel run on the vein, from which, in former years, a large amount of a fair grade of ore was taken. There is a 10-stamp mill, also an arrastra and two vanners; the power being developed from a 25′ overshot and a small Pelton wheel (for the concentrators). The stamps weigh 650 lbs., drop 6″ 85 times per minute, and crush 12 tons per day through a No. 10 screen. The hoist is driven by a 17″ Leffel turbine. A home-made dynamo for 200 incandescent lights supplies a few lights to the buildings. Water is diverted from Ward Creek through a flume. Ten men are employed. J. Gruss et al., of Genesee, owners; J. Gruss, manager.

Gladiator (*Sunnyside, Franklin, etc.*) *Mines* (Drift).—They lie at the S. end of McRae Ridge, 9 miles W. of Johnsville, at 6,425′ and 7,290′ elevation, and consist of a group formerly known as the *Sunnyside*, 160 acres; *Franklin*, 180 acres. They are being prospected under a bond, and on the Sunnyside various openings and drifts have been made on the course of the channel. On the Franklin claim there is a 360′ tunnel; on the *Beckwith* there is a 200′ tunnel that cuts a ledge. On the side of the ridge, on the Sunnyside, a good deal of hydraulicking has been done, resulting in obtaining considerable nugget gold, some pieces weighing several thousand dollars. A good many of the bowlders indicate glacial action. Aside from the direct mining operations, borings have been made to locate the lay of the channel. The Sunnyside tunnel has been driven 830′, through lava and clay. Near the breast a shaft was sunk 105′ and a drift extended 90′ N. The latter part of the drfft is on the incline, and cuts through 4′ of gravel next the bedrock, the latter pitching to the N.W. The general course of the channel appears to be S.W. A good deal of the ground could be worked to advantage by hydraulicking, if the facilities for impounding the debris were favorable. For three months in the year snow-water is available through a ditch, 1¾ miles long, 2′ wide and deep, with ¾″ to the rod grade. Twelve men are employed. William Doolittle, of Dutch Flat, Placer County, superintendent.

Glazier Mine (Drift).—See our Xth Report, p. 495. It is on the North Fork of Feather River, 4 miles S.E. from Butte Valley, at 3,525′ elevation, and comprises 165 acres on the Dutch Hill channel. A tunnel at the lower end of the claim and about 1 mile from the old workings has been driven 1,000′ through slate bedrock, and some little drifting has been done. It will be continued until the "back rim" is passed. It is 600′ below the surface of Big Flat and 40′ beneath the channel, with which it is connected by several upraises. A 65′ air-shaft connects with the tunnel 100′ from the mouth. The mine water, filling a reservoir 12′x 16′x 6′ every two hours, is used in washing the gravel. No breasting has been done. Six men are employed, working two shifts. Dr. J. P. Welch, of Butte Valley, owner.

Golden Reef Mine (Drift).—See our XIIth Report, p. 216. It is on Spanish Creek, 2 miles W. of Quincy, at 3,200′ elevation. Since our last Report the drift has been continued up channel, and a shaft sunk. Agassiz & Shaw Co., of Boston, Mass., owners.

Golden Stair Mine (Hydraulic).—It is a new enterprise on Clear Creek, situated 10 miles S. from Genesee, at 6,683′ elevation, and comprises 160 acres on what is supposed to be the "Old Blue Lead" channel. A 100′ shaft has been sunk 22′ through barren gravel and 80′ through gray lava. The company has built 3 miles of road. Three men are at work. R. W. White, John Sparks, et al., of Genesee, owners.

Gold Log Mine (Drift).—It is situated on Grizzly Creek, 6 miles S. of Genesee, at 5,775′ elevation, and comprises 100 acres. Four bedrock tunnels have been driven, mostly too high, though all show river-wash of large bowlders, but without gold. The ground appears to be a portion of a slide from the main channel. The present tunnel is 500′ in length. Next to the creek, just beyond this point, nugget gold has been found. Two men are at work. W. H. Adams and C. Morain, of Genesee, owners.

Gold Mountain Consolidated Mine (Drift).—See our XIth Report, p. 332. It is situated ½ mile N.E. of La Porte, at 5,000′ elevation, and comprises five claims. Idle. An incorporated company, of Streator, Ill., owner.

Good Hope (*Richmond Hill*, *Sawpit Flat*), *Mines* (Hydraulic and Drift).—They are 6 miles N. of Gibsonville, Sierra County, at an elevation of about 6,000′, and contain 2,400 acres. These old mines were extremely rich in former days, and are being prepared to work again by the hydraulic method. Dams are in course of construction. The gravel bank at Sawpit Flat is about 100′ high. To reopen the Richmond Hill channel a tunnel will be necessary. Between 2,000 and 3,000 miner's inches of water, taken from a reservoir at Onion Valley through about 10 miles of ditch, and delivered under 300′ pressure, are available. Two monitors, with 5″ nozzles, and 450′ of 4′ bedrock flume, are to be used. Twenty-five men are at work—ten on the dam and fifteen on the ditches and pipe-lines. An incorporated company, owner; A. H. Schnabel, of Gibsonville, superintendent.

Governor Mine (Quartz).—See Butterfly Mine.

Granite Basin Beauty Mine (Quartz).—See Homestake.

Grant & Davis Mine (Quartz).—It is at the head of Kellogg Ravine, 14 miles N.W. from Spanish Ranch, at 3,500′ elevation, and comprises two claims, forming the extension of the Shenandoah Mine. It is being opened up by a cross-cut, at present in 50′. Quite a distance will have to be driven before cutting the vein. The main vein, where uncovered, shows 2½′ of solid quartz, between slate walls, with numerous stringers making from the walls. Two men are at work. J. Grant and T. Davis, of Spanish Ranch, owners.

Graves Mine (Quartz).—It is 5 miles N.E. from Merrimac, Butte County, at 4,730′ elevation. The claim includes three claims from 18″ to 2′ in width, in granite, trending N.E. and S.W. It is developed by a 75′ and a 300′ tunnel on No. 1 vein, a 75′ and a 35′ tunnel on No. 2 and No. 3 veins, respectively. Three tons of ore are crushed daily in a 4-stamp mill with 275-lb. stamps, driven by a 6′ hurdy wheel under 45′ pressure, with water taken from Arrastra Creek, through ¼ mile of ditch. Two men are at work. W. C. Graves, of Merrimac, Butte County, owner.

Green Ledge Mine (Quartz).—It is on Ward Creek, about 4 miles S. from Genesee, at 4,100′ elevation. The vein carries carbonate and sulphides of copper, with gold, and trends N.E. The surface ore was formerly worked in an arrastra, and is said to have yielded as high as $60 per ton. J. Young and C. F. Brown, of Taylorsville, owners.

Green Mountain Mine (Quartz).—See our VIIIth, XIth, and XIIth Reports, pp. 479, 471, and 217. It is situated ½ mile W. of Crescent Mills, at 3,850′ elevation, and is 4,500′ by 600′. During the past year No. 6 tunnel, over 1 mile long, has been cleaned out, retimbered, somewhat extended, and several cross-cuts made through the vein. Twenty-five men were employed. Idle, pending sale under a bond. J. Goodwin et al., of Quincy, owners.

Grizzly Bear Mine (Hydraulic).—It is on Squirrel Creek, 4 miles N. of Johnsville, at 5,800′ elevation on the bedrock, and contains 160 acres. It is not a true wash gravel, but in the nature of a glacial drift. The bank is 25′ high and 200′ wide, with coarse gold throughout. Three hundred miner's inches of water are brought from Bear Creek, through 1½ miles of ditch, 4′ wide on the bottom, during three months in the year. Two giants, with 3″ and 4″ nozzles, under 250′ pressure, are used, and two pipe-lines, 400′ long, reducing from 18″ to 12″. The flume is 2′ wide, 1,000′ long, and paved with wooden blocks. Six men are employed. N. Rossi & Co., of Johnsville, owners.

Halsted Mines (Quartz).—See our XIth Report, p. 326. They are situated on the east branch of North Fork of Feather River, near the mouth of Rush Creek, at Twelve-Mile Bar, 9 miles N.W. of Spanish Ranch, at an elevation of 3,100′ to 4,000′, and consist of the *Byers*, *Joe Halsted*, and *Rich Gulch* claims, each 1,500′ by 600′. The average course of the ledge is N. 50° W., and dip 50° N.E., inclosed in slate, with large blowout 18′ to 20′ wide. It is developed through numerous tunnels. The whole mass is low-grade, carrying a small percentage of sulphurets, chiefly near the walls. A 4-stamp water-power mill is connected with the property. Idle. Joe and A. D. Halsted, of Spanish Ranch, owners.

Happy Thought Mine (Quartz).—See Homestake.

Hibernia (*Pennsylvania*) *Mine* (Quartz).—It is 2 miles S.E. from Greenville, at 4,325′ elevation, and contains two claims, 1,500′ by 600′ each, on a vein 5′ to 12′ wide, with a N.W. trend and vertical dip, between syenite walls. The four main working cross-cut tunnels have been reopened and retimbered by the new owners. A new 10-stamp mill has been built 1 mile below the mine. The 20 inches of water for power are derived from McClellan Ravine, and delivered under 300′ pressure. Fourteen men are employed. B. F. Gullic, C. J. Cloud, et al., of Greenville, owners; C. Robertson, of Greenville, superintendent.

Holloway Mine (Hydraulic).—It is on the forks of Hopkins Creek, 8 miles N.E. of Gibsonville, at an elevation of 5,000′. The claim is on the "Blue Lead," and carries a clean, cemented gravel on the slate bedrock. The pit is 250′x 400′ and 27′ high, and of this 150′x 300′ was worked last year. Seventy per cent of the gravel is bowlders. One giant, with 3″ and 4″ nozzles, under 150′ pressure, is used. Water is taken from the west branch of Hopkins Creek through a ditch between 2 and 3 miles long. The water season lasts three months. The tail-flume is 300′ long and 30″ wide. Six men are employed. Spencer & Gould, of Gibsonville, owners.

Homestake (*Swan*) *Mines* (Quartz).—They are 6 miles N.E. of Merrimac, Butte County, at 4,875′ elevation, and comprise the *Happy Thought*, *Granite Basin Beauty*, *Siebbert*, and *Homestake* locations, with a separate vein on each, all trending N.E. in the granite, with an average width of about 20″, and carrying 1% of high-grade sulphurets. There are two tunnels on the Homestake, 300′ and 400′ long, and stoped 70′ from the surface. On the Siebbert a shaft has been started. On the Happy Thought there is a 60′ tunnel on the vein, giving 20′ of backs. On the Granite Basin Beauty there is a 25′ shaft. A 5-stamp water-power mill, with 450-lb. stamps and 24′ overshot wheel, crushing 3 tons in twelve hours, is on the property. Four men are employed. John Garner, of Chico, Butte County, owner.

Horseshoe Mine (Quartz).—See Crescent.

Hungarian Hill Mine (Hydraulic).—See Plumas-Imperial.

Hungarian Hill Mining Co.'s Mine (Hydraulic and Drift).—It is 3 miles S.W. of Quincy, at about 4,700′ elevation, and embraces 500 acres. The ground was formerly worked as a hydraulic; later it was decided to drift the lower strata, and a tunnel was run 400′ through slate bedrock, but did not reach the channel, probably because it changed its direction; so the claim is being refitted as a hydraulic. The water for the purpose is taken from Gansner Ravine and Slate Creek, through two ditches, whose capacities are 800 and 400 miner's inches, respectively, emptying into three reservoirs. The tailings will dump into Quigley Ravine, where a log and brush dam will give ample and safe storage. Four men are at work. J. H. Whitlock et al., of Quincy, owners.

Indian Hill Mine (Hydraulic).—It is 12½ miles S.W. from Spanish Ranch, at 2,450′ elevation, and comprises three claims. The gravel bank is 50′ high and 300′ wide, and is worked through a bedrock cut dumping on a bar on the east branch of the North Fork of Feather River. The percentage of bowlders and cobbles is very large, and the gold is quite coarse and mostly on the bedrock. One quarter of an acre has been washed this season with 100 miner's inches of water, delivered through 500′ of 11″ pipe to a giant with 3½″ nozzle, under 100′ pressure. A hand-power derrick, with 40′ mast and 35′ boom, is used to remove bowlders. The water is diverted from Kellogg Ravine, through 1 mile of ditch, and lasts from three and a half to four months. The tail-flume is 300′ long and 18″ wide, in which pole riffles are used, and is cleaned up once during the season. Three men are employed. Eyrand & Lasirer, of Spanish Ranch, owners.

Indian Valley Mine (Quartz).—See our Xth Report, p. 473. It is 1 mile S. from Greenville. Well opened. Furnished with 20-stamp water-mill, air-compressor, machine drills, etc. Idle, on account of differences with the water company.

Jamison Mine (Quartz).—See our VIIIth, Xth, XIth, and XIIth Reports, pp. 480, 483, 330, and 217. It is 2 miles S. of Johnsville, at about 5,000′ elevation, and is temporarily idle. The water-right is one of the finest in the State, and consists of four natural lakes with a ditch of 1,000 miner's inches capacity, and 1¼ miles long, delivering the water under 500′ pressure. An incorporated company, owner; — Cheney, of Johnsville, superintendent.

Joe Mine (Quartz).—See Halsted.

John Bull and Phœnix Mine (Quartz).—See our XIIth Report, p. 217. It is situated 2½ miles in a S.E. direction from Greenville, at 3,600′ elevation. Since our last Report the Phœnix tunnel has been driven 540′ on the vein to intersect a heavy vein running S. 54½° W., which at the crossing of North Cañon shows 18′ wide, dipping E. In about 56′ the tunnel will reach the vein. The ore in the mine is extremely low-grade. Two men are at work. S. Firmstone and John Richards, of Greenville, owners.

Kanaka Flat Mine (Placer).—It is 6 miles W. of Spanish Ranch, at 3,200′ elevation, and comprises 60 acres of shallow gravel (from 1′ to 3′ deep), spread over a large flat; dumping facilities are poor. The gold contained in the gravel is fine. Water is diverted from Spanish Creek and Kanaka Flat. Two men are at work. Jack & Wampler, of Spanish Ranch, owners.

Keystone Mine (Quartz).—See Brant Point.

King's Gravel Mine (Drift).—See our XIIth Report, p. 217. It is on the North Fork of Feather River, 12 miles from Prattville, at 3,450′ elevation. Since our last Report, 100′ of air gangway has been driven, and 450′ in length of the channel has been breasted 120′ wide, timbered with 4′ posts and caps. New buildings and roads have been built. The tailings of this mine are sold to a company of Italians for reworking, the company previously washing through three sets of flumes, with falls of over 10′ between. Undercurrents will be also used. Six men are at work. F. King et al., of Butte Valley, owners.

King Solomon's Mine (Quartz).—It is 9 miles N.E. of Taylorsville, at 6,500′ elevation, and comprises seven claims on two parallel veins 200′ apart, 12′ and 64′ wide, respectively, trending N.W., and dipping about 65° N.E., between slate and greenstone, carrying a good selvage on both sides. In the 5′x 8′ vertical shaft, at a depth of 60′, drifts have been run, 100′ to the N. and 50′ S. on the foot-wall side, which carries for 20′ wide a better grade of ore than the remainder of the vein. It is said the entire width of the vein mills not over $3 per ton. A cross-cut has been started at this depth to cut the smaller or N.E. vein, but had to be stopped for lack of air. These veins can be tapped at a depth of 2,000′ by driving 5,000′ of tunnel. Electric power can be developed for use at the mines at some waterfalls 5 miles distant. The country is well timbered. Two men are at work. G. Compton and D. Cate, of Quincy, owners.

Kirkham Mine (Placer).—It is on the south bank of the North Fork of Feather River, 4 miles E. of Butte Valley, at 3,425′ elevation, and contains 20 acres on a bar of the river. The pit is about 10′ deep and 50′ wide, and requires the use of a water-power derrick, with 40′ mast and 26′ boom, to remove the bowlders. Four men are employed. F. Ackels, F. Mori, et al., of Butte Valley, owners.

Last Chance Mine (Drift).—It is 3 miles S. of Butte Valley, at 3,400′ elevation, and contains 20 acres. It is being reopened by a drift (40′ long at present) to strike the Dutch Hill gravel channel; it will be necessary to drive about 150′ farther. One man is at work. S. Deane, of Butte Valley, owner.

Last Chance Mine (Placer).—It is on Grizzly Creek, 7 miles S. from Genesee, at 5,300′ elevation, and contains 40 acres on a former bench of Grizzly Creek. A cut 40′x 50′ and 15′ deep has been made into the gravel. Water is obtained from Clear and Grizzly creeks, through ½ mile of ditch of 200 miner's inches capacity. The tail-flume, 18″x 20″, is 45′ long, and furnished with pole riffles. Three men are at work. F. Duchaine, of Genesse, owner.

Lee Mine (Quartz).—See Crescent.

Leete's Mine (Quartz).—It is situated on the ridge between Indian and Round valleys, 2½ miles W. from Crescent Mills, at 4,875′ elevation, and comprises an agricultural patent of 160 acres, containing several parallel N. and S. veins; the one being developed is 20″ wide in granite, carrying free-milling quartz. A shaft 4′x 5′ has been sunk 120′ deep on the vein with a horse-whim, and is being continued. A second vein, 3½′ wide, has had a tunnel driven on it for several hundred feet. Seven men are at work. B. F. Leete, of Greenville, owner.

Lewis Mine (Quartz).—It is N. of and adjoins the Halsted claims, 9 miles N.W. of Spanish Ranch, at 3,900′ elevation at tunnel. It consists of two locations. It is prospected by a cross-cut tunnel, which reaches the Halsted ledge 252′ in, where the vein is 28″ wide. In continuing the cross-cut 38′ a small, rich stringer, 2″ to 10″ wide, was cut and drifted upon S. 90′. The vein trends N. 65° W., and dips 80° N.E. Idle. Frank Hill, of Spanish Ranch, in charge.

Lights Mines (Quartz).—See California.

Lily Mine (Quartz).—See Florence Consolidated.

Little Jamison Mine (Quartz).—See Jamison.

Lone Star Mine (Hydraulic).—See Tefft & Co.

Lost Channel Mine (Drift).—It is on the E. side of Feather River, 2 miles E. from Cromberg, at 4,800′ elevation, and comprises 160 acres on an old channel. The depth of the gravel and lava cap is 190′. A bedrock tunnel 220′ long has been driven and an upraise of 6′ made into the channel, but the latter has not been drifted across, nor has any gravel been washed to date. An incline sunk on the vein ½ mile above proved the presence of gold on the bedrock. Water is obtained from Jackson Creek, through 1½ miles of ditch with 3′ bottom and 300 miner's inches capacity, which can be delivered under 200′ pressure. Three men are at work. J. Neville, Langhorst Bros., and others, of Cromberg, owners.

Lucky S. Mine (Quartz).—See our Xth Report, p. 467. It is on Kettle Rock Peak, 11 miles N. from Taylorsville, at 6,800′ elevation. There are two locations, designated Lucky S. No. 1, and a 5-acre mill-site and a timber claim. The two veins, 4′ and 6′ wide, respectively, in the two claims, are parallel and about 600′ apart, coursing N.E. and S.W., and dipping 60° S.E., in granite. The main tunnel on No. 1 is a cross-cut 184′ to the ledge, with a 227′ drift, which gives 138′ of backs. Connecting with it is a 6′x 8′ shaft 138′ deep, which is supplied with a hoist, a Worthington pump, and an 8 H.P. upright engine, consuming 1 cord of wood per day. On vein No. 2 is a 90′ cross-cut to the vein and a 288′ drift. The cross-cut was continued to strike a third parallel vein, but has not yet reached it. This tunnel is provided with an air-shaft 78′ deep. The mill site is on Peter's Creek, ½ mile from the mine, and the cost of hauling is 40 cents per ton. The mill contains 5 stamps of 750 lbs., crushing 8 tons per day. The pulp passes over 8′ of apron-plate and 6′ of sluice-plates, set on 1¼″ grade, to a rubber, thence on 6′ more of plate to a Johnston concentrator. The power is supplied by a 5′ Pelton wheel under 150′ pressure, with water from Peter's Creek. The tailings are impounded to be reworked. On account of the heavy snows prevalent the mill can be run only nine months in the year. On No. 2 a tunnel has been started 200′ below the present workings, to which point the mill will be removed, to avoid hauling the ore and to enable the mill to run throughout the year. Portions of the ore carry 5% of high-grade sulphurets. Timber of excellent quality abounds on the claim. Eleven men are at work. H. C. Langrehr, of Phelan Building, San Francisco, and others, owners; H. C. Langrehr, manager.

Malvern Hill Mine (Drift).—It is 2 miles E. of Butte Valley, at 3,550′ elevation, and comprises 80 acres of ground on the course of the Dutch Hill channel. The bedrock tunnel is 684′ long, with an upraise of 170′ in the north back rim; the rims are 200′ apart. Fifteen feet above the tunnel, in the upraise, a drift has been started. The course of the tunnel is slightly to the E. and N. Two men are at work. E. Davis and C. Bressler, of Butte Valley, owners.

Mayflower Mine (Drift).—It is 6 miles S. of Quincy, at an approximate elevation of 5,800′, and comprises 200 acres of what is supposed to be part of the channel that is being worked at Sawpit Flat. A 300′ tunnel has been driven, which will have to be extended 500′ to reach the supposed channel; 600 miner's inches of water, with 250′ pressure, can be obtained from the east branch of Rock Creek. Four men are at work. W. S. Webb, W. Edwards, et al., of Quincy, owners.

McGill & Standart Consolidated (*Drury and Pacific*) *Mine* (Quartz).—See our VIIIth and Xth Reports, pp. 480 and 473. It is in North Cañon, 2 miles S. of Greenville, at 3,850′–4,000′ approximate elevation, and comprises four mining locations and two timber claims. The vein courses E. and W., and dips 80° N., between syenite walls, with a serpentine belt on the south of the syenite about 600′ from the vein. The ore is low-grade, but on account of favorable location can be mined and milled for $2 per ton. The mine has been developed through three tunnels from North Cañon. The chief workings are at present between tunnels Nos. 2 and 3. The upper portion of the mine is pretty well worked out, only a little stoping being done above tunnel No. 2, which is 2,000′ long and cut by a shaft designated the Pacific, beyond which are three pay-shoots. The breast of tunnel No. 2 is 350′ below the surface. Tunnel No. 3 is 250′ below No. 2, and follows 1,200′ on the vein. At 1,000′ from the mouth of the tunnel a cross-course cuts the vein; this shows itself in the company's ground first about 75′ above tunnel No. 2, where the apex is quite narrow, widening as it gains in depth. One of the pay-shoots, known as the "sulphuret shoot," contains a good grade of sulphurets, worth saving; heretofore no concentrators have been used. The 15-stamp water-mill crushes 20 tons per day. The ore is hauled out of the mine by horse-power, 5 one-ton cars to a train. Timber of fine quality is abundant. Sixteen men are employed in the mine. G. Standart and R. McGill, of Greenville, owners; G. Standart, superintendent.

Megown Mine (Quartz).—See our Xth and XIth Reports, pp. 484 and 324. It is 7 miles S.W. from Spanish Ranch, and consists of two locations. Since previous Report the tunnel has been extended and a lower one started, opening a good vein. Two men are at work. J. Megown, of Spanish Ranch, owner.

Michigan Hill Mine (Placer).—It is situated on Michigan Hill, about 5 miles N.E. from Quincy, at 3,325′ elevation, on bedrock. The course of the ancient channel is N.E. and S.W., and it is being worked 100′ wide along the E. rim. The gravel bank is 30′ high, with a pipe-clay capping from 2′ to 8′ thick, and red soil above, carrying the gold mostly on the bedrock, although some gold is found even in the soil. An area of 130′x 75′ was washed during the season, which lasts only three months, being slightly extended through the use of a reservoir that empties in 1½ hours. Water is diverted from Cashman Creek, near Hough's Peak, and is brought through 3½ miles of ditch, crossing a 325′ depression of Spanish Creek by a siphon pipe 1,300′ long and 22″ to 15″ diameter. The ditch is 2½′ in the bottom on a natural grade, and carries 200 miner's inches, delivered to one giant in the cut under 80′ pressure, through 600′ of 15″ and 11″ pipe. The tail-flume is 1,200′ long and 26″ wide, paved with wooden blocks, and set on a 10″ grade to the box. It is cleaned up at the end of the season. J. B. Higgins, of Quincy, owner.

Morning Star Mine (Quartz).—See Robinson.

Mountain Chief Mine (Quartz).—See our XIIth Report, p. 218. It is on the main branch of Mill Creek, about 4 miles S.E. from Quincy, at about 3,450′ elevation. Instead of a vein, a belt of slate, with interstratified stringers of quartz with a general E. and W. course, is being worked; some of these quartz stringers assume a width of several feet in places, as is shown where the creek has cut across the strata. The developments have been made through an open cut and a shaft 100′ deep. The quartz has been crushed in a 12′ arrastra on Mill Creek, but proved to be very low-grade. Two men are at work. Judge J. C. Clough, of Quincy, owner.

Mountain King (*Butte Bar*) *Mine* (Quartz).—It is situated on the Middle Fork of Feather River, 10 miles S.W. from Quincy, and consists of two claims, separated by the river, and designated as the *Brown Bear* and *Lucky S*. The 5′ vein courses nearly N. and S., between slate and a dike, and shows little or no free gold in the horn-spoon, but a very heavy percentage of gold-bearing sulphurets. In an early day a large pocket of free gold was taken from the vein on the river bank. Two tunnels have been driven on the vein, 150′ and 70′ long. Idle. Frank E. Thomas, of Quincy, owner.

Musick & Schaefer (*Blackhawk*) *Mine* (Placer).—It is 5½ miles N. of Quincy, at 3,350′ elevation, and contains 160 acres. At present the work is confined to the bed of Blackhawk Creek, using water from Little Blackhawk and Butterfly creeks through two ditches, 1 mile and 3 miles long. Two men are at work. Musick & Schaefer, of Quincy, owners.

New Jersey Mine (Drift).—See our XIIth Report, p. 218. It is 11 miles N. of Gibsonville, at 5,700′ elevation, and contains 240 acres on the N. end of Blue Mountain. T. Chapman, of Gibsonville, owner.

Ninety-Three Mine (Quartz).—See our XIIth Report, p. 218. It is situated near Sulphur Creek Ranch, 5 miles from Mohawk.

North Fork Mine (Drift).—See Dutch Hill.

North Star Mine (Quartz).—See Robinson.

Northern Mine (Hydraulic).—It is 16 miles S.E. of Quincy, not far from Cromberg, at 5,570′ elevation, and contains 480 acres of ground. The present working-pit shows a bank 125′ high; 1,000 miner's inches of water are obtained from Little Long Valley Creek, through 3 miles of ditch, 3′ on bottom, 5′ on top, and 2½′ deep, with ⅝″ grade per rod, and delivered to a No. 4 giant under 210′ pressure. The water season lasts five months. There are several lines of tailrace, with an undercurrent attached to the lowest series; they are set on a grade of 14″ to the box, and dump into Little Long Valley Creek, across which a series of five dams, from 150′ to 250′ long and 20′ high, in the center of creek-bed, have been built. Idle. Pitner Traynor, of Quincy, manager.

Ohio Mine (Placer).—See our XIIth Report, p. 218. It is 6 miles S.E. from Mohawk, at about 6,000′ elevation, and contains 120 acres. J. C. Knickren et al., of Mohawk Valley, owners.

Ohio Point Mine (Quartz).—See Duncan.

Oliver Quick Mine (Quartz).—It is 5 miles N.E. from Merrimac, Butte County, at 4,700′ elevation. The 2′ N. and S. vein dips 70° E., in a granite formation, and is developed through two tunnels; the upper one is 300′, the lower 700′ long. The quartz carries 1½% of high-grade sulphurets. Two men are at work. J. Pappin, of Merrimac, Butte County, owner.

Ophir Mine (Drift).—It is 5 miles N. of Gibsonville, at 6,475′ approximate elevation, and contains 2,000′ front and thence back to center of ridge, on the course of the Gibsonville channel. A tunnel, 600′ long, to bottom of the channel, was laid too high; a second one has been started, which will have to be driven 240′ and then connected by upraise with the channel. Six men are employed. W. E. Bainbridge, of Gibsonville, owner.

Ophir Mine (Quartz).—See Crescent.

Orr Mine (Hydraulic).—See Plumas-Imperial.

Phœnix Mine (Quartz).—See John Bull and Phœnix.

Pilot Hill Gold Mine (Quartz).—See our XIIth Report, p. 218. It is near the foot of Pilot Hill, at the head of Onion Valley, 6 miles N.W. from Gibsonville, at about 7,000′ elevation, and comprises six claims. P. F. Turner et al., of Gibsonville, owners.

Pipe Mine (Placer).—It is an adjunct of the Hibernia quartz mine, and is in McLellan Ravine, 2 miles S.E. of Greenville, at an elevation of 4,250′, and contains 70 acres. Water is obtained from the ravine and the Round Valley Water Co.'s ditch. Idle. B. F. Gullic et al., of Greenville, owners.

Plumas-Eureka Mine (Quartz).—See our VIIIth, Xth, XIth, and XIIth Reports, pp. 476, 482, 330, and 219. It is ½ mile W. from Johnsville, its highest point being at 7,565′ elevation, and the lowest tunnel 6,000′ elevation. Most of the present work is carried on in the old "76" ground. Of the 60 stamps, only 15 are dropping. The water for power is brought through 4 miles of flume from Jamison Creek, and delivered under 260′ pressure on an 8′ Knight wheel. A relay 75 H.P. steam-engine is also on hand. Fifty men are at work. Sierra Buttes G. M. Co. (Ltd.), of England, owners; Wm. Johns, of San Francisco, general manager; — Thomas, of Johnsville, superintendent.

Plumas-Imperial (*Hungarian Hill and Orr*) *Mines* (Hydraulic).—See our Xth and XIIth Reports, pp. 479 and 219. They consist of two claims, the *Emigrant Hill* and *Hungarian Hill*. The former is 2 miles N. of Quincy and embraces 300 acres, and has never been worked, but is being prospected by shafts and tunnels. The latter is 4½ miles S.W. of Quincy, embraces 900 acres, ranging in altitude from 3,600′ to 4,035′. Work is being prosecuted on the Hungarian Hill claim, on a large body of gravel, at a place known as *Five Points*, where several cañons appear to have emptied into a single depression. Where the gravel bank has been faced up it is over 100′ deep, and carries different grades of gravel, interstratified with pipe-clay and sand. Two ditch systems, known as the upper and lower, divert the waters from Dean's Valley, east and west branches of Rock Creek, Beaver, and Deer creeks. The upper or principal ditch is 9¾ miles long, with a capacity of 2,000 miner's inches; the lower ditch is 3 miles long, with a capacity of 800 miner's inches. The water is stored behind a dam at the head of Dean's Valley, forming a lake 15′ deep, which is drawn from as required. The pipe-line, 5,000′ long, of 22″ diameter, is made of No. 14 iron. The former owners of this gravel deposit have never been able to bottom it. The present pit shows a face 600′ to 700′ long and over 100′ high, with the bedrock still pitching. A bedrock tunnel had been driven from the Rock Creek side to what was supposed to be the lowest point, and an upraise of 30′ made to the gravel; this has lately been cleaned out, retimbered, and a 4′ flume placed in the bottom, on an 8″ grade. Radial bedrock cuts will lead to the upraise, to permit all the gravel being handled through this tunnel, which furnishes a 60′ dump into a flat formed by a curve of Rock Creek. By extending the tunnel the Quigley Ravine side will also be passed through to the Rock Creek dump. This arrangement will permit of a much larger area of gravel being handled each season. One half mile below the dump in Rock Creek is a stone restraining dam, 30′ wide at the base, 17′ at the crest, 20′ high, and 85′ long from bank to bank. A good wagon road has been constructed up Slate Creek, connecting the mine with the county road between Quincy and Spanish Ranch. To the present time only one giant, with 7½″ nozzle, has been used. The gravel carries gold throughout, though coarsest and best near the bedrock; some of this gold is black and rusty. Eighteen men are employed at present around the mine, ditches, and flumes, but later only seven men, working two shifts, will be required. C. D. Hazzard, of Minneapolis, Minnesota, owner; — McGillvray, of Quincy, superintendent.

Quincy Mining and Water Co.'s Mines (Hydraulic).—See our XIIth Report, p. 219. This property is situated on Gopher Hill and Shores Hill, along the north bank of Spanish Creek, about 3 miles W. of Quincy, at 3,800′ elevation on bedrock, and comprises 2,200 acres. Five giants, supplied with 6″ and 8″ nozzles, are used in the three different pits. At Gopher Hill the bank is from 80′ to 100′ in height; at the City Point claim, gravel is 10′ to 12′ deep on the north end and 50′ on the south end; on the N.E. side there is 15′ of reddish quartz gravel. Last season 200,000 cu. yds. of gravel were moved. There are three radiating branch sluices 3,000′ long, 4′ wide, set on a 6″ grade, paved with rock riffles, and cleaned up every twenty days. It is said 1,000 miner's inches of water move 1,000 cu. yds. of gravel in thirteen hours. The gold is coarse and nuggety, and is found mostly on the bedrock. The bedrock is cleaned twice, one season after the other. The company have built four restraining dams, the upper one of gravel, across Wanponsey Creek. The debris drops in a lake 12′ to 15′ deep, and after settling passes over a spillway to the second and third dams. These dams are 300′, 800′, and 200′ apart. The upper dam is 22′ and the second 20′ high. The company's water-supply is obtained from Gold and Silver lakes on Spanish Peak, and from Bean and Spanish creeks. The main ditches are 24 miles long, carrying about 2,000 miner's inches, and the branch ditches 54 miles long, carrying from 500 to 1,000 miner's inches. The pressure from the main reservoir is 350′, and gives ten hours piping. The pipeline, 22″ and 11″, made out of No. 12 iron, is between 5,000′ and 6,000′. Twenty men are employed. An incorporated company, of Quincy, owner; A. B. White, of San Francisco, superintendent.

Rattlesnake Mine (Drift).—See Ding Dong.

Rich Gulch Mine (Quartz).—See Halsted.

Richmond Hill Mine (Hydraulic and Drift).—See Good Hope.

Riverdale Mine (Drift).—See Elizabethtown Gravel Channel.

Robinson (*Morning Star and Trenton*) *Mine* (Quartz).—It is situated in Granite Basin, 8 miles N.E. from Merrimac, Butte County, and contains two locations, designated the *North Star* and the *Trenton*, at 4,750′ elevation. The vein, 2′ to 4′ wide, trends N.E. and S.W., and dips 80°

S.E., between a granite and diorite contact. Frazier Creek divides the two claims. Developments consist of a 3½'x 6' shaft, 70' deep, with steam hoisting plant. The quartz in the bottom of the shaft carries 3% of high-grade sulphurets. A No. 3 Hooker pump is driven, with a speed of 30 strokes per minute, by a 14 H.P. engine. The 20-stamp water-mill (with only one battery in running order) is situated on Frazier Creek, a short distance from the shaft, and is connected with it by a tram-road. The mill has 900-lb. steel-shod stamps and one Johnston concentrator driven by a 5' Knight wheel, under 94' pressure. The water is diverted from Frazier Creek, through 1,650' of ditch of 200 miner's inches capacity. Tunnels have been run on the vein from both sides of the creek, the four on the North Star being 400', 260', 300', and 40' long, respectively, with the intervening ground mostly stoped out. The tunnel on the Trenton is 200' long, with some little stoping. The shaft on this vein is the deepest of any mine in the basin. Seven men are employed. E. C. Robinson, of Merrimac, Butte County, owner.

Round Valley Consolidated (*Arcadian*) *Mining Co.'s Mine* (Quartz).—It is on the E. side of North Cañon, 2 miles S.E. of Greenville, at 3,900' elevation, and contains four locations and a mill site. There is a main N. and S. vein and two E. and W. feeders, 6' wide, dipping nearly vertically. The developments consist of a main cross-cut tunnel (at present inaccessible) 700' long to the vein, near the south end of the claim; thence a drift 500' to the north country with a shaft; the John Taylor tunnel, 450' long, striking one of the feeders, and developing three pay-shoots between where the vein is tapped and where it connects with the N. and S. vein; pay-shoots have likewise been cut on the other veins. The quartz is low-grade. The 10-stamp steam-mill, with 750-lb. stamps, is furnished, besides the plates, with two rubbers, but no concentrators. Timber is abundant. Idle. An incorporated company, of Greenville, owner; D. NcIntyre, of Greenville, manager.

Russian Mine (Drift).—This is a prospect on the course of the old Dutch Hill channel, 11 miles from Prattville, at 4,025' elevation, and comprises 60 acres, on which a bedrock tunnel has been started. B. Piazzonia and J. Borsini, of Butte Valley, owners.

Salmon Falls Mine (Drift).—See our XIIth Report, p. 220. Assessment work only. D. McIntyre et al., of Greenville, owners.

Savercool Mine (Quartz).—See our Xth Report, p. 493. It is situated 4 miles E. of Butte Valley, on the North Fork of Feather River, at 4,000' elevation. Idle. Savercool Bros. et al., of Butte Valley, owners.

Sawpit Flat Mine (Hydraulic and Drift).—See Good Hope.

See & Seren Mine (Quartz).—See Specimen.

Senator Perkins Mine (Quartz).—It is 5 miles N.E. of Merrimac, Butte County, at 4,750' elevation. The vein courses N.E. in the granite. The developments consist of a 30' tunnel and a 20' open cut. The quartz carries high-grade sulphurets. Two men are at work. — Blazel, of Oakland, owner.

Shenandoah Mine (Quartz).—See our XIth and XIIth Reports, pp. 324 and 220. It is at the head of French Ravine, 12 miles N.W. of Spanish Ranch, at 2,350' elevation, and comprises three quartz and two placer claims. The developments include three tunnels on the vein, 160', 50', and 100' long, and a 45' winze from tunnel No. 1 sunk on the pay-shoot. The large percentage of sulphurets found in the ores interferes with the successful milling; at least the tailings are found to carry a high percentage of gold, and new and better methods are being sought. The 10-stamp mill was run by water obtained from Clear Creek through 1¼ miles of ditch of 350 inches capacity. The climatic conditions and locality make it troublesome to work the property in winter. Two men are at work. An incorporated company, of Oakland, owner.

Siebbert Mine (Quartz).—See Homestake.

Silver Star Mine (Hydraulic and Placer).—It is about 1½ miles W. from Spanish Ranch, at 3,500′ elevation, and includes 80 acres of ground. The 15′ bank carries 4′ to 5′ of gravel next to a false bedrock. Three acres have been worked. The mine has been enjoined, hence only the creek-bed can now be worked by ground-sluicing. Water is obtained from Silver Creek through two ditches 2 miles long and 200′ apart, but finally uniting; the grade is ¾″ to the rod and 250′ pressure is obtained. A pipe elevator, with a 15″ discharge pipe and a 4″ nozzle below, was in use here, to raise the tailings 24′ high; 2,200′ of piping, of 18″ and 11″ diameter, was used, including the 200′ branch to the elevator. The tail-flume is 600′ long and has 30″ bottom and block riffles. Taylor Bros., of Spanish Ranch, owners.

Soda Bar and Eclipse Mine (Placer).—It is 9 miles S.W. from Crescent Mills, at 2,800′ elevation, and contains 80 acres. This gravel deposit is on a bench of Soda Creek, and varies in depth from 3′ to 40′; the present bank has a 20′ face. The gold is coarse, partly quartz-gold, and all next the bedrock. Water is taken out of Soda Creek through a short ditch, furnishing 150′ pressure during the season, lasting eight months. Although very heavy bowlders are found next to bedrock, no derrick is used. The tail-flume is 84′ long and 20″ wide, set on a grade of 18″ per box, and paved with Hungarian and pole riffles. Five men are employed. W. Edwards and G. M. Cooksey, of Quincy, owners.

Sonoma Mine (Quartz).—It is 8 miles N.E. from Merrimac, Butte County, at 4,950′ elevation. The location embraces two veins, 18″ to 24″ wide and 100′ apart, coursing N.E. and S.W., and dipping 80° S.E., in granite. The quartz carries 1½% of sulphurets. The veins are developed through a tunnel 180′ long, cutting both veins, with drifts on both, giving 60′ of backs. An 8′ continuous-working arrastra, supplied with screens, is driven by a 15′ overshot wheel, 20″ breast, with water from Buckhorn Creek. Three men are employed. Murphy & Son, of Merrimac, Butte County, owners.

Specimen (See & Seren) Mine (Quartz).—See our Xth Report, p. 490. It is in Granite Basin, 8 miles N.W. from Merrimac, at 4,900′ elevation. A new tunnel, above the former tunnels, has been driven to the vein, and the pay-shoot tapped. Four men are employed. See & Jolly, of Merrimac, Butte County, owners.

Sunnyside Mine (Drift).—See Gladiator.

Sunnyside Mine (Drift).—It is 2 miles S.W. of Butte Valley, and contains 220 acres on the Dutch Hill channel, at an elevation of 3,550′ at tunnels. At different times during the past twenty years four tunnels have been driven to tap this channel, all of which were too high, bedrock never having been reached. Under the present management a new tunnel (now 50′ long) has been started near the mouth of Clear Creek, and will be below the lowest point of the channel. The lowest of the old tunnels was 800′ long, and a gangway, 5′ in the clear, was driven 160′ across the channel. A very large amount of water flows from the mine, which is used for washing the gravel. The breasts are carried 25′ wide and 5′ high. The gravel is tight, requiring the use of powder. A breaster can dig 4 to 5 cars, each of 1,500 lbs. capacity, per day. All bowlders are stowed. There are neither lava bowlders nor clay in the gravel. There is a dump of several hundred feet into the North Fork of Feather River. The water from the mine is retained in a 10′x 12′x 5′ tank, which fills in ten minutes; the gravel is washed through six 14″ boxes, set on an 18″ grade per box. Ten men are employed. Col. Day, of Butte Valley, owner.

Swan Mine (Quartz).—See Homestake.

Swiss Mine (Drift and Quartz).—It is 11 miles W. of Prattville, at 4,025′ elevation, and comprises 45 acres between Sunnyside and Dutch Hill. An 800′ drift, through the slate rim and lava, cuts the gravel on a bench of the channel, which was breasted 100′ across, with bedrock pitching away. The course of the channel was N.E., and extremely large bowlders were found mixed with the gravel; in spots the gravel carried considerable clay. The gold is coarse and heavy. A breaster can dig 7 cars of 1,500 lbs. each per day. The gravel is washed through 20 boxes, with 14″ bottoms and 1½″ grade to the foot, paved with Hungarian and pole riffles. The boxes are cleaned up every night. Water is obtained from Owl Creek through 200′ of 11″ pipe. Crossing the company's ground is a quartz vein, 12′ to 20′ thick, coursing N. and S., and dipping 55° W., in slate walls. It was cut in the bedrock tunnel, giving 115′ of backs, and carries a considerable percentage of iron sulphurets. The outcrop of the vein is largely lava-capped. Two men are employed. B. Piazzonia, of Butte Valley, owner.

Taylor Diggings Mine (Hydraulic).—See California Gold Mining and Investment Co.

Tefft & Co.'s (*Lone Star and Concordia*) *Mine* (Hydraulic).—It is near Cromberg, 18 miles S.E. of Quincy, and comprises 400 acres on two adjoining claims, designated as the *Lone Star*, containing 160 acres, at an elevation of 4,700′, and the *Concordia*, with 240 acres, at 5,450′ elevation. At present the mine has been temporarily enjoined for noncompliance with some of the Debris Commissioner's regulations. The pit in the Lone Star is about 20′ deep, extending 600′ and about 300′ across; the average depth of gravel is about 10′. This has the appearance of being a break, or "spill over," from the main channel, coursing N. and S. further in the hill upon which the Concordia is situated. One monitor, with 11″ inlet and 5½″ nozzle, working under 300′ pressure, is used in the Lone Star ground; also a 1 H.P. derrick, with 30′ boom. The pipe-line is 1,700′ long, reducing from 22″ to 11″. Water is obtained from Long Valley and Jackson creeks, with three systems of ditches; the Lone Star ditch is 3½ miles long, 6′ on top, 4′ on bottom, and 3′ deep, carrying 1,500 inches of water; the Jackson ditch is 7′ on top, 5′ on bottom, 3′ deep, and 1½ miles long; the irrigation ditch is 5′ on top, 3′ on bottom, and 2½′ deep. Aside from these, Coggswell Ravine furnishes some water during three months in the spring. It is said the cost of construction of the Lone Star ditch was $20,000. For the Concordia claim the water is brought through the Concordia ditch, 5 miles long, 3′ on bottom, and of 600 miner's inches capacity. The water season is three months in the spring, and is somewhat extended through reservoirs, which permit from three hours to five hours piping per day. There are 1,400′ of 42″ tail-flume, set on a 5½″ grade, and paved with 9″ blocks. The debris from this claim dumps into Coggswell Ravine behind the Lone Star dam, which is built across Jackson Creek, and is of stone, 1,500′ long, 40′ wide on bottom, and 41′ high in center, providing a restraining area of 100 acres; 1,500′ beyond is a "logskidded" dam, 12′ high on the lower side, for a settling pond. Tefft & Co., of Cromberg, owners; W. deVinney, of Cromberg, manager.

Telge Mine (Quartz).—It is 4 miles N.W. of Genesee Valley, at 5,550′ elevation. The vein is 5′ wide, courses N.E., and dips 50° N.W., in granite. A 300′ cross-cut tunnel has been run to the ledge, and drifted 75′ south on the vein. An incline on the vein above the tunnel is down 35′. The cross-cut furnishes 250′ of backs. The ore carries copper sulphides. Two men work part of the season. Barney Telge, of Reno, Nev., owner.

Toland & Langdon's Mine (Hydraulic).—It is 2½ miles N.W. from Spanish Ranch, and contains 40 acres. Water is used from Burton Ravine and Clear Creek.

Trenton Mine (Quartz).—See Robinson.

Tucker & Brown Mine (Placer).—It is 2 miles W. of Spanish Ranch, at 3,000′ elevation, and contains 20 acres. The ground is heavily timbered, and the gravel worked is from 4′ to 10′ deep, resting on a hardpan; the bedrock proper has never been reached. The gold is of medium size. Water is obtained from Clear Creek, through 3 miles of ditch of 400 miner's inches capacity. Three men are employed. Tucker & Brown, of Meadow Valley, owners.

Ward Mine (Quartz).—See Genesee Valley.

White Oak Mine (Quartz).—See Black Oak.

Wildcat Mine (Drift).—See our XIIth Report, p. 220. It is 10 miles S. of Prattville. S. Cameron, of Prattville, manager.

Workman Mine (Quartz).—It is on the Little North Fork of Middle Fork of Feather River, 5 miles N.E. from Merrimac, at 4,700′ elevation. The vein is 2′ wide, heavily sulphuretted, courses N.E. and S.W., and dips 60° S.E., in granite. The developments are carried on through two tunnels. Two men are at work. W. B. Harbin, of Merrimac, Butte County, owner.

Yankee Bar Mine (Placer).—It is on the North Fork of Feather River 3 miles S.E. of Butte Valley, at an elevation of 3,400′. The pit is 50, wide and gravel 14′ deep, with a large amount of bowlders, requiring a derrick with 42′ boom, and driven by a 11′ overshot water-wheel. The gravel contains coarse gold throughout, partly black and rusty. Twelve lengths of 14″ flume are used, with Hungarian riffles and poles for washing. Two men are at work. S. Dean, of Butte Valley, owner.

Yellow Creek Mine (Placer).—It is on Yellow Creek, 18 miles W. from Spanish Ranch, at 2,000′ elevation, and contains 40 acres along the creek. The pit is 20′x 40′, and the gravel is 6′ to 7′ deep. A hand-derrick, with 25′ mast, and a Chinese pump, run by an undershot wheel 8′ in diameter and 14″ wide, are used. The tail-flume is 150′ long and 12″ wide, set on an 8″ grade, and cleaned once a week; the gold is coarse. The wingdam incloses an area of 40′ wide and 200′ long. Two men are employed. S. P. Maxwell, of Spanish Ranch, owner.

Yet Lee Co. Mine (Placer).—This is 2 miles S. from Rich Bar, on Long Bar, at 2,000′ elevation, and contains 40 acres. The pit is 20′ deep, with 12′ original gravel. A water-power derrick (overshot), using 40′ mast, and a Chinese pump, run by a 12′ current-wheel, are used, and 150′ of 14″ flume are required for washing. Fourteen Chinese are at work. A Chinese company, owner.

MILLS IN PLUMAS COUNTY.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of Each, in Lbs.	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
					No.	Character.	No.	Capacity.		
Butterfly	Steam	10	800	14	1	Frue			(Gold King Amalg.)	
Centennial		10								
Coquette	Water	10	750	15						
Crescent	Steam	30	800	60						
Fall River Consolidated	Water	5	750	7½	1	Frue				
Four Hills		10	1,000							
Gallagher	Water	8	650	4						
Genesee Valley*	Water	10	650	12	2					
Green Mountain	Water	30	750							
Graves	Water	4	275	3						
Hibernia	Water	10	750	20						
Homestake	Water	5	450	3						
John Bull and Phœnix	Water	5	750	7½						
Kettle	Water	20	850	50						
Lucky S.	Water	5	750	8	1 1	Rubber Johnson				
McGill and Standard Consolidated	Water	15	750	18–20						
Plumas Consolidated	Water	24	850	36						
Plumas-Eureka	W. & S.	60	750	30	24	Hendy				
Round Valley	Steam	10	750	20	2	Rubber				
Robinson	Water	20	900	30	1	Johnson				
Shenandoah	Water	10	750	15			1	5 tons.	(Gold King Amalg.)	
Specimen	Water	4	500	4						

In addition to stamps, the mills marked with a * have additional crushing capacity, as noted in the following list:

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN PLUMAS COUNTY.

Name of Mill or Mine.	Power.	Number	Character.	Diameter	Capacity per 24 Hrs., in Tons.
Black Oak			Arrastra		1
Cleveland	Water	2	Arrastra		4
Diadem		1	Huntington		
Frazier*	Steam	1	Huntington		20
Genesee Valley		1	Arrastra		
Mountain Chief			Arrastra		4
Sonoma	Water		Arrastra		4

*The Frazier Mill has one Triumph concentrator.

Riverside County.

Alice Mine (Quartz).—See our XIIth Report, p. 221. It is 4 miles S. of Menifee, at 1,500′ altitude. Since our last Report some development work has been done and a 5-stamp mill erected, but all operations are now suspended. Estate of J. M. S. Egan, of Perris, owner.

Barker Mine (Quartz).—It is situated near Warren's ranch, about 20 miles N.E. of White Water Station. It is reported that the developments have exposed a promising vein of gold-bearing quartz. C. O. Baker, of Banning, owner.

Bowlder Mines (Quartz).—This property is 45 miles N.E. of Salton, and comprises claims in the Hathway and Eagle mountains. Considerable development work has been done within the past two years. In prospecting for water, several shafts were sunk, one of which is said to be 450′ deep, but dry. Water has been found at 75′ from the surface in the desert wash, 10 miles from the mines. A "Wiswell" mill will be built at once. The principal claim is the *Bowlder*, situated in the Hathway Mountains, at 2,000′ altitude. The workings consist of three shafts, 30′, 50′, and 110′ deep, respectively; a 200′ tunnel on the vein, and several superficial cuts. The vein strikes N. and S., and is nearly vertical. Bowlder Mining Co., of Los Angeles, owner; E. J. Delano, of Salton, superintendent.

C. & C. Consolidated Mine (Quartz).—It is 4 miles W. of Perris, at 1,800′ elevation. A 150′ tunnel has been driven, and a shaft is now being sunk on a small vein in granite. J. B. Dennis, of Perris, owner.

Coffee Mine (Quartz).—It is in the Chuckawalla Mountains, 4 miles S. of Corn Springs. A 56′ shaft has been sunk on an 18″ vein at the northeast end of the claim, jointly with the *Ritchie* Mine. The vein strikes N.W. Coffee & Co., of Salton, owners.

Colorado (*Justice*) *Mine* (Quartz).—It is 4 miles S.W. of Perris. It was worked some years since in a small way. Idle. Knight et al., of Perris, owners.

Columbus Mine (Quartz).—See Monte Negras District.

Desert Queen (*McHeney*) *Mine* (Quartz).—It is 28 miles N. of Indio. It has been superficially worked quite extensively during the past two years. Some of the quartz has been so rich in gold as to cause the most extravagant reports of the value of the mine. The rock is crushed in a 5-stamp mill, located near a well, 6 miles from the mine. A small force

Good Hope Mine.

Santa Rosa Mine.

is employed. C. M. Thompson, of Pasadena, owner; H. C. Steele, of Banning, superintendent.

Fish Mine (Quartz).—It is 6 miles N.E. of Dos Palms, a station, and about 12 miles N.E. of Salton, at 1,000′ elevation. A 90′ tunnel has been run and other superficial work done on a vein of gold quartz. A 2-stamp mill, to be run by a gasoline-engine, is now being built at Cañon Springs, 6 miles from the mine, to which the ore will be hauled. A. C. Fish, of San Bernardino, owner.

Free Coinage and Charity Mines (Quartz).—See our XIIth Report, p. 221. These claims join and are situated 18 miles N. of Durmid Station and 5 miles from Cañon Springs. E. E. Bowles, of Salton, owner.

Gavilan Gold Mines (Quartz).—They are on the San Jacinto Estate, 8½ miles N.W. of Perris, at 2,200′ altitude. There are twenty-seven claims in the group, upon some of which prospecting is being done, but no active mining operations are in progress. H. B. Varcoe, of Perris, agent.

Golden Chariot Mine (Quartz).—It is 5½ miles W. of Perris, and is the south extension of the Santa Rosa Mine. The main shaft, 310′ deep, is at 2,360′ elevation, and one level has been run, near the bottom. The vein strikes N. 10° W., and dips 55° to 45° W. A 20 H.P. steam-power plant is employed in hoisting. The mine has no mill. Seven hundred gallons of water are raised from the mine daily by a steam pump. Charles L. French, of Redlands, owner; J. M. Day, of Redlands, superintendent.

Good Hope Mine (Quartz).—See our VIIIth, IXth, XIth, and XIIth Reports, pp. 527, 151, 106, and 221. Since our last Report the mine has been in litigation, and idle the greater part of the time. It is understood operations are about to be resumed, under the ownership and management of the former owner. I. Siegenfuss, of Perris, owner.

Gypsy Mine (Quartz).—It is 4 miles W. of Virginia Dale, and about 50 miles N. of Walters Station, at 1,800′ altitude. A 115′ shaft has been sunk on a vein which dips 66° W., and strikes N. and S. Drifts have been run at 50′ and 100′ from the surface. Hoisting has been done with a horse-whim. A 1-stamp mill has been built on a dry lake near this mine for the purpose of prospecting this and other claims in this region. The mill will be operated by a gasoline-engine. Esler, Ingersoll, et al., of San Bernardino, owners.

Hexahedron Mine (Quartz).—See our XIIth Report, p. 223. It is 25 miles N.E. of Indio. Some prospecting and development work have been done since our last Report, showing a good grade of gold-bearing rock. Tingman & Holland, of Indio, owners.

Indian Queen Mine (Quartz).—It is 4½ miles W. of Perris, and is a new prospect. A 65′ shaft has been sunk on a vein, striking N.W. and dipping 70° S.W. A small steam hoist and a 5-stamp steam-power mill comprise the surface equipment. It is also supplied with a 4″ Cornish pump. J. B. Dennis, of Perris, owner.

Ingersoll (*Ramona*) *Mine* (Quartz).—It is 50 miles N.E. of Walters Station in the Monte Negras District. The vein strikes N. and S., and is nearly vertical. It varies from 1′ to 3′ in width. There are two shafts, 40′ and 80′ deep, respectively. Elser, Ingersoll, et al., of San Bernardino, owners.

Jumbo Mine (Quartz).—It is 5 miles W. of Perris, at 2,200′ altitude. The vein strikes N. 10° W., and dips 80° W. A 50′ shaft has been sunk with a windlass. The vein is small. M. E. Bethurum, of Perris, owner.

Justice Mine (Quartz).—See Colorado.

Lane Mine (Quartz).—It is a prospect, in the Hathway Mountains, with superficial development. The quartz is crushed in an arrastra. Lane & Son, of Salton, owners.

La Plomo (Quartz).—See Victor.

Leon Mine (Quartz).—See our XIIth Report, p. 223. It is on the Briggs ranch, 14 miles S.E. of Perris. The vein strikes N.W., and dips 85° S.W. The main shaft is now 150′ deep, and sinking is continued with a horse-whim. No mill. S. R. Porter et al., of Winchester, owners; S. R. Porter, superintendent.

Little Maggie Mine (Quartz).—See our XIIth Report, p. 223. It is 4 miles W. of Perris. The vein strikes E., and dips 45° S. There are two inclined shafts, 175′ and 100′ deep, respectively. Idle. J. M. Hassen, of Perris, owner.

Little Pete Mine (Quartz).—It is 4 miles W. of Perris, at 2,000′ elevation. A 30′ incline has been sunk on a small E. and W. vein containing arsenical pyrite. J. B. Dennis, of Perris, owner.

Lost Horse Mine (Quartz).—See our XIIth Report, p. 223. It is 20 miles N. of Indio, at 5,000′ elevation. Since our last Report development work has been steadily continued. An 80′ tunnel has been driven on the vein, a 50′ winze sunk, and a 50′ drift run east from the bottom of the winze. The greater portion of this work is in good rock. A 235′ vertical shaft has also been sunk with a horse-whim. A 2-stamp mill has been built 5 miles N. of the mine, near some springs. Ryan & Kelsey, of Banning, owners.

Lucky Boy (*Walker*) *Mine* (Quartz).—See our XIth and XIIth Reports, pp. 385 and 223. It is on the Walker ranch, 2 miles S. of Menifee. Two shafts, 50′ and 60′ deep, respectively, have been sunk on a small vein. As water proved troublesome a pump was placed in the mine, and is operated by a gasoline-engine. L. Walker, of Menifee, owner.

McHeney Mine (Quartz).—See Desert Queen.

McKinley Bill Mine (Quartz).—See O. K.

Mammoth Mine (Quartz).—It is 9 miles S. of Perris, at 1,600′ elevation. The vein averages 7′ thick, ranging from 4′ to 10′, strikes apparently N.E., and dips 15° N.W. The croppings are exposed 400′ around the side of the hill. Superficial cuts have been made at various points, and at the end of the 100′ cut a 200′ incline extends on the vein. A cross-cut connects with an air-shaft, 60′ to the surface. The inclosing rock is grano-diorite. The quartz of the vein is evenly impregnated with pyrite, and shows free gold at many places. The prospects are encouraging. Stephens & Banta, of Menifee, owners.

Menifee Mine (Quartz).—See our XIth Report, p. 385. It is 8 miles S. of Perris, at 1,500′ altitude. The 100′ shaft is being extended. There are three other shafts, 30′, 55′, and 125′ deep, respectively. The vein strikes N.E., and dips 75° N.W. The surface plant consists of a steam hoist and a 5-stamp mill. H. N. McGready et al., of Menifee, owners.

Messenger Mine (Quartz).—It is on Eagle Mountain, 40 miles N.E. of Walters Station. The vein is from 3′ to 4′ wide, and from the 100′ shaft

50′ drifts have been run N. and S. W. H. Bradley, of Boyle Heights, Los Angeles, owner.

Missing Link (*Virginia-Shay*) *Mine* (Quartz).—See our VIIIth, XIth, and XIIth Reports, pp. 526, 385, and 225. It is in Pinacarte District, 6 miles W. of Perris. Idle for the past two years. J. B. Dennis, of Perris, owner.

Monte Negras District.—See our XIth and XIIth Reports, pp. 368 and 224. This district lies about 50 miles N.E. of Walters Station, between Virginia Dale and Eagle Mountain, and first came to public notice in the spring of 1892; since then considerable prospecting has been done, claims abandoned and relocated. Within the past year two mills have been built on Virginia Dale side, where water is obtained by sinking wells in the desert valley. On the south side no water has been found nearer than Cottonwood Springs, 25 miles distant. Ore is now being hauled from the claims on the south side of the district to an arrastra at Cottonwood Springs. These claims are the *Columbus*, *Porcupine*, *Republican*, *Summit*, and *Venus*. Shallow shafts and short tunnels have been made on each.

O. K. Mine (Quartz).—It is 18 miles N.E. of Indio, at 3,000′ elevation, and is a new prospect having a 30′ shaft. Tingman & Holland, of Indio, owners.

O. K. (*McKinley Bill*) *Mine* (Quartz).—It is in the Monte Negras District, 50 miles N.E. of Walters Station. The vein occurs in diorite, and is from 1′ to 4′ wide. Two shafts, 30′ and 40′ deep, respectively, have been sunk on the vein, and preparations made to haul ore to the mill at Virginia Dale. Esler, Ingersoll, et al., of San Bernardino, owners.

Onward Mine (Quartz).—See our XIIth Report, p. 224. It is 45 miles E. of Danby, between Virginia Dale and the Colorado River. The property is in the prospective stage. L. Gray & Bro., of Phœnix, Arizona, owners.

Ophir Mine (Quartz).—It is 6 miles S.W. of Perris, at 1,650′ altitude. A 100′ shaft has been sunk on a small vein in granite. The hoisting engine has been removed. There is a Huntington mill on the property. Perris Mining and Development Co., of Perris, owner; Fletcher Mott, superintendent.

Perris Mine (Quartz).—It is 5 miles W. of Perris, at 2,200′ altitude. A shaft has been sunk 60′ on an E. and W. vein, dipping 80° S. A 25′ drift has been run E. from the bottom of the shaft. The fissure is a heavy one, in granite, being accompanied by a dike, but there is little quartz in the crevice. W. F. Bray, of Perris, owner.

Pinon Mountain Mines (Quartz).—See our XIIth Report, p. 224. A small force is employed working on the several claims of the group. The ore is crushed in a 2-stamp mill near the mines. L. B. Woodworth, of Los Angeles, owner.

Porcupine Mine (Quartz).—See Monte Negras District.

Ramona Mine (Quartz).—See Ingersoll.

Republican Mine (Quartz).—See Monte Negras District.

Ritchie Mine (Quartz).—It is in the Chuckawalla Mountains, 4 miles from Corn Springs, and is worked jointly with the *Coffee Mine*. Ritchie & Co., of Salton, owners.

Rosalia Mine (Quartz).—See Santa Rosa.

San Diego Mine (Quartz).—See our XIIth Report, p. 224. It is in the Chuckawalla Mountains, 45 miles N.E. of Salton. Some development work has recently been done on this property, with encouraging results. E. E. Bowles et al., owners.

Santa Fe Mine (Quartz).—See our XIIth Report, p. 224. Within the past two years a cross-cut tunnel has been driven 700′ into the hill to intersect the vein exposed on the surface and in the incline shaft. To all appearances this tunnel cut the vein nearly 500′ from its mouth, but the fact was not recognized by the miners. A 5-stamp mill has been erected on the property, but is idle. F. M. Woods et al., of Pomona, owners.

Santa Rosa (*Rosalia*) *Mine* (Quartz).—See our VIIIth, XIth, and XIIth Reports, pp. 526, 385, and 225. It is 5½ miles W. of Perris, at 2,200′ altitude. There are two incline shafts, 125′ and 420′ deep, respectively. The surface plant consists of a steam hoist and a 20-stamp steam-power mill. The vein strikes N. 10° W., and dips 45° W. The mine was not in operation at the time of the visit of the Field Assistant, and an inspection of the mine was not permissible. It is claimed that two shoots of quartz have been exposed in the workings. Santa Rosa Mining Co., of Boston, Mass., owner; G. W. Commons, of Perris, superintendent.

S. S. Mine (Quartz).—See our XIIth Report, p. 224. It is in the Virginia Dale region, near Lyon's well. T. B. Lyon, of San Bernardino, owner.

Summit Mine (Quartz).—See Monte Negras District.

Stanford Mine (Quartz).—See our XIIth Report, p. 225. It is 5 miles S.W. of Perris. Idle. Hearn Bros., of Perris, owners.

Sterling Mines (Quartz).—This property consists of a group of claims, 30 miles N.E. of Salton, in the Hathway Mountains, at 2,000′ altitude. Considerable superficial work has been done, and a 10-stamp mill is now building near the mines. The Sterling Mining Co., of Los Angeles, owner; — Bowers, of Salton, superintendent.

Venus Mine (Quartz).—See Monte Negras District.

Victor (*La Plomo*) *Mine* (Quartz).—See our VIIIth, XIth, and XIIth Reports, pp. 527, 384, and 225. It is 4½ miles S.W. of Perris, at 2,200′ altitude. Idle. H. C. Steele, of Perris, owner.

Virginia Dale Mines (Quartz).—This property comprises a group at and near Virginia Dale, 55 miles N.E. of Walters Station. The veins are from a few inches to 2′ in width. Active work was commenced on these mines in the summer of 1896, and a 5-stamp mill moved from 29 Palms to the vicinity of the mines. Rev. M. Phelps et al., of Pasadena, owners.

Virginia Mine (Quartz).—See Missing Link.

Walker Mine (Quartz).—See Lucky Boy.

MILLS IN RIVERSIDE COUNTY.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of Each, in Lbs.	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
					No.	Character.	No.	Capacity.		
Alice		5	850							
Desert Queen		5	850	10						
Fish	Gasoline	2	750	3						
Gipsy	Gasoline	1	700	2						
Good Hope		20	850		8					
Indian Queen		5	400	5						
Lost Horse	Steam	2	850	4						
Menifee		5	750	10						
Pinon Mountain	Steam	2	850	4						
Santa Fe		5	500	10						
Santa Rosa	Steam	20	850	50						
Stanford		5	500							
Virginia Dale		5	750							

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN RIVERSIDE COUNTY.

Name of Mill or Mine.	Power.	Number	Character.	Diameter	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
						No.	Character.	No.	Capacity.		
Lane			Arrastra								
Monte Negras			Arrastra								
Ophir		1	Huntington	3′							

Sacramento County.

The resources of Sacramento County are both mineral and agricultural. With the decadence of the former, there has been a steady development of the latter, until to-day the county has thousands of acres of land in the highest state of cultivation. Close proximity to large local markets and cheap transportation favor the farmer. The mineral industry is confined chiefly to the placer and drift mines along the lower foothills from the American to the Cosumnes River. In addition to these may be mentioned the extensive quarries of granite and macadam at the Folson Prison, the various manufacturing establishments for converting clay into pottery, brick, sewer-pipe, etc. The prison buildings, the great dam across American River, the head-gates and power-house, are all constructed from massive blocks of cut stone from these quarries. A new industry has been established near the prison, where a great quarry is being opened to furnish broken stone to be used in macadamizing roads throughout the State, under the direction of the State Bureau of Highways. At Folsom, 2 miles below the prison, there has been installed an extensive electric plant, transmitting an abundance of current to Sacramento for power, lights, etc. (See special article.) A limited supply of natural gas has been obtained at Sacramento, with artesian water, but is not utilized. (See our XIIth Report and Bulletin No. 3, pp. 350 and 10–15.) The county is well watered, both by stream and subterranean sources.

Addison Mine (Drift).—It is situated in the outskirts of Folsom, and covers a number of town lots. Mining privileges are leased to a number of Chinamen, who are sinking a shaft. Mr. Addison, of Folsom, owner.

Blue Ravine Mine (Drift).—It is 4 miles N.E. of Folsom, near Mormon Island. A shaft has been sunk 60′ to bedrock, and pay-gravel encountered. The power for hoisting and pumping is furnished by a threshing-machine engine. Hart Mining Co., owner; F. P. Jackson, of Folsom, superintendent.

Buckeye Flat Mine (Placer).—It is on Buckeye Flat, 2½ miles S.W. of Folsom. D. Finch & Co., owner; P. O'Neil, of Folsom, superintendent.

Donnelly Reservoir Mine (Placer).—It is 2½ miles S.E. of Folsom, and is worked by a Chinese company. Ah Cum, of Folsom, superintendent.

Eckhardt Mine (Placer).—It is 3 miles S.E. of Folsom, and is worked by ground-sluicing. Chinese are employed. P. D. Eckhardt, of Folsom, owner.

Folsom District.—The mines in the vicinity of Folsom have been worked since the discovery of gold in California, and have yielded a large amount of gold. Since the inhibition of hydraulic mining the business is carried on in a small way by the ground-sluice and drift methods, more than 150 men being thus employed, of whom about one half are Chinese. In addition to the mines mentioned, there are a large number of wandering Chinese who go from place to place, with pan and rocker, working over old tailings and occasionally striking small areas of virgin ground. As these miners sell their gold to Chinese merchants, no information as to the amount obtained is available. Wells, Fargo & Co.'s agent at Folsom reports the shipment from his office at $12,000 to $20,000 per month. The estimate of the gold *not* passing through the express office is placed at 20% of the total amount. There are many claims on the Natoma Grant, which are worked by lessees, who pay the company a stipulated price for the water, retaining whatever profit may be derived from mining operations. A number of claims are worked under this system by Portuguese.

Folsom Water Power Co.'s Mine (Placer).—See our Xth Report, p. 512. It is located in the bed of the American River, from the dam above the prison for a distance of 2 miles down the stream. It is said to be the intention of the company to divert all the water from the river at its lowest stage, through their canals, and then mine the river-bed. Folsom Water Power Co., of San Francisco, owner.

Humbug Hill Mine (Placer).—It is 1¼ miles S.E. of Folsom, and is worked by Chinese. Ah Chew, of Folsom, superintendent.

Lake Shore Mine (Drift).—It is on Rebel Hill, 3 miles S. of Folsom. There are four shafts, each 60′ deep. A 6′ pay stratum is being worked. The bedrock is volcanic ash (tufa). Both white men and Chinese are employed. M. H. Burke, of Folsom, owner and superintendent.

Lawson & White Mine (Drift).—It is 1 mile N.W. of Folsom, on Big Creek. Two prospecting drifts are being driven. Lawson & White, of Folsom, owners.

Maben & Nickerson Mine (Drift).—It is 2 miles S. of Folsom. A prospecting shaft is being sunk. Maben & Nickerson, of Folsom, owners.

Mahoney & Keefe Mine (Placer).—It is on Willow Spring Hill, 2 miles S. of Folsom; formerly a large hydraulic mine, it is now worked by ground-sluicing. Mahoney & Keefe, of Folsom, owners; Robert Keefe, of Folsom, superintendent.

McCue Mine (Drift).—See our XIIth Report, p. 227. It is a short distance below the town of Folsom, and about 60′ above the bed of American River. A shaft was sunk for the purpose of reaching the *true* bedrock, either granite or amphibole rock. The following strata were passed through:

Cobblestones and gravel	10′
Tufa	40′
Gravel, containing some gold	12′
Tufa, coarse	5′
Gravel, gold-bearing	0′3″
Tufa, coarse	6′
Sand, fine-grained and colored dark green (probably volcanic mud)	20′
Gravel, containing iron sulphurets, but no gold	6′
Fossiliferous gray sand	20′

Nothing has been done in this shaft for some time past, owing to the great volume of water encountered. Most of this water comes from the upper layers, and it is the intention to bulkhead this, and another attempt will then be made to reach bedrock. McCue & Bates, of Folsom, owners.

Mendota Mine (Placer).—It is in the bed of American River, a short distance below Folsom. A company has been organized to work the river-bed, but operations have not yet commenced. Mendota Gravel Mining Co., of Sacramento, owner.

Michigan Bar Mines (Hydraulic).—See our VIIIth Report, p. 556. They are situated at Michigan Bar, on the Cosumnes River, 12 miles N.W. of Ione. They have been worked many years. Interior Development Co., of San Francisco, owner. D. R. Thomas, of Michigan Bar, superintendent.

Perry Mine (Placer).—It is 3 miles S.E. of Folsom, and is worked by ground-sluicing. F. Perry & Co., owners; Frank Perry, of Folsom, superintendent.

Rebel Hill Mine (Placer).—See our Xth Report, p. 510. It is on Rebel Hill, 3½ miles S. of Folsom, and worked by ground-sluicing. Perry & Rogers, of Folsom, owners; Frank Perry, of Folsom, superintendent.

Rogers Mine (Placer).—It is 2½ miles S.W. of Folsom. It is being supplied with new flumes, etc. Rogers & Co., of Folsom, owners; A. Rogers, of Folsom, superintendent.

Rollins Mine (Placer).—It is 3 miles S. of Folsom, and is worked by ground-sluicing. The bank is 20′ to 40′ high. R. J. Rollins, of Folsom, lessee and superintendent.

Salvador Mine (Placer).—It is 3 miles S. of Folsom. Salvador & Co., of Folsom, owners.

Sulky Flat Mine (Placer).—It is 1½ miles S.W. of Folsom. Worked by Chinese. Ah Cum, of Folsom, superintendent.

White & Donnelly Mine (Drift).—See our XIIth Report, p. 227. It is on the railroad company's right of way in the town of Folsom. The privilege of mining is leased to miners, who have sunk several 40′ shafts. Both white men and Chinese are employed. White & Donnelly, lessees; M. H. Black, of Folsom, superintendent.

White, Donnelly & Cooney Mine (Drift).—It is 2½ miles S.W. of Folsom, on the railroad company's right of way. Worked under lease. A prospect shaft is being sunk. White, Donnelly & Co., of Folsom, lessees.

Willow Spring Hill Mine (Placer).—It is 2 miles E. of Folsom, and is worked by ground-sluicing. Robert Keefe, of Folsom, owner and superintendent.

Zimmerman Mine (Quartz).—It is 5 miles S.E. of Folsom. It has a 30′ shaft, and is on patented land. Idle.

San Benito County.

The principal industries are agriculture, fruit-growing, and stock-raising. The mineral industries, which are important sources of revenue, and promise well for the immediate future, are lime and quicksilver. Antimony, coal, chromic iron, copper, gold, gypsum, iron, manganese, and petroleum occur either in too limited quantities or too far from transportation for their profitable exploitation. The valley lands are abundantly supplied with water from streams, artesian and other wells.

Chalone Mine.—See our XIIth Report, p. 227. It is on a ridge near South Chalone Peak, 35 miles S.E. of Hollister, at about 2,200′ altitude, and is reached by trail from the mouth of Bear Valley. The development consists of a 500′ tunnel, run from the north side of the ridge, about 400′ below the summit. The country rock is a light-colored liparite in which traces of gold are said to exist, probably as a primary constituent. No important veins or especially disturbed zones occur, and the liparite becomes more compact and less ferruginous as the breast of the tunnel is approached. Idle. Thomas Flint, of Hollister, owner.

San Justo Mine.—It is in the San Juan Cañon, on the Flint ranch, 7 miles W. of Hollister, at about 400′ elevation. The country rock is gray porphyry; the feldspar is somewhat decomposed, and numerous seams of iron pyrite strike in almost every direction. The pyritiferous ore is said to assay $1 25 to $5 per ton in gold. The main tunnel has been driven 700′ northeasterly, from which a 100′ branch extends. The ore is said to become richer as the tunnel progresses. Two men are employed. Thomas Flint, Jr., of Hollister, owner.

San Bernardino County.

The past two years has witnessed an increasing interest in mining affairs in this county. A number of new mines have been discovered in the Mojave Desert region, and mills have been moved from old, inoperative mines to newer ones. Several prospecting mills have been built for the purpose of testing properties, and a vast amount of prospecting done in both old and new districts. The silver and borax mines are worked regularly, and lime, granite, and marble quarries have received the usual attention. There are many latent resources in the county which will be developed when better or cheaper transportation facilities are afforded.

Althea (*Embody*) *Mine* (Quartz).—See our XIth Report, p. 361. It is at Oro Grande, at 2,800′ elevation. Idle. H. Eaton Estate, of Los Angeles, owner.

Altuma Mine (Quartz).—See our XIIth Report, p. 229. It is 15 miles E. of Bear Valley Lake and about 3 miles S. of the Rose Mine, at 8,000′ elevation. The vein strikes N. 80° E., and dips 25° to 50° S., in a granite formation. The fissure is quite irregular in dip and has numerous branches. The quartz is from 1″ to 2′ wide, often disappearing altogether for considerable distances. There are three tunnels near the top of the hill, two of which are driven on the vein, and the other cross-cutting to it. Considerable stoping has been done. Much of the development work has been performed in an erratic manner. About 125′ lower than the lowest of the above-mentioned tunnels a cross-cut tunnel has been driven 426′ into the mountain. At 286′ from the mouth a fissure was passed through which, to all appearances, is the same as that above, but the owners, evidently thinking otherwise, have driven the tunnel beyond. Drifts have been run 30′ each way from the cross-cut on this crevice, but as neither the quartz nor gold was found, all work has been abandoned for the present. The mine is equipped with a 10-stamp steam-power mill. Water is obtained from springs in Antelope Cañon. The pay-rock is delivered to the mill by means of an iron-pipe chute, about 700′ in length. The mill is 475′ vertically below the head of the chute. Altuma Mining and Milling Co., of San Bernardino, owner; G. E. Otis, of Redlands, president.

Alvord Mines (Quartz).—See our VIIIth and XIth Reports, pp. 499 and 359. This property is 23 miles N.E. of Daggett, and comprises six claims, the principal one being the *Royal*. Since our last Report considerable prospecting has been done, and a 5-stamp mill erected within 2 miles of the mines for the purpose of testing the ores. On the Royal Mine there are over 1,000′ of levels, and several hundred feet of winzes, cross-cuts, stopes, and open cuts. On the other claim the development consists of open cuts of various sizes. Idle. Alvord Mining Co., of Pasadena, owner; G. B. Senter, of Pasadena, agent.

Bear Valley.—See our XIIth Report, p. 229. No mining is being done in this valley, though there was considerable activity in Holcomb Valley, 3 miles distant, the past year.

Black Hawk Mines (Quartz).—See our IXth, Xth, XIth, and XIIth Reports, pp. 226, 524, 364, and 230. They are 40 miles E. of Victor, at about 5,000′ elevation. Since our last Report the 10-stamp mill has been removed to the Altuma Mine. Considerable sluicing of old dumps has been done, which it is claimed paid well. The principal claims are the *Lookout*, *Santa Fe*, and *Opera*. From the latter some high-grade ore is being shipped. These mines seem to have possibilities, but have been practically idle for some years. Cook & Leach, of Victor, owners.

Blue Jacket Mine (Quartz).—See Red Cloud.

Boomerang Mine (Quartz).—See our XIth and XIIth Reports, pp. 367 and 230. It is ½ mile S. of Vanderbilt, at 5,000′ elevation. There are several shafts, the principal one being vertical and 550′ deep, and equipped with steam hoist. A 10-stamp steam-power mill is located 3,000′ from the mine. Water is supplied from the mine. Prospecting work only is being done. A. G. Campbell, of Salt Lake, owner; George Nay, of Vanderbilt, superintendent.

Brick Mine (Quartz).—It is ½ mile S. of Vanderbilt, at 5,000′ elevation, and joins the Boomerang Mine. It has a 300′ tunnel and a 104′ shaft. A. G. Campbell, of Salt Lake, owner.

Burnap Mines (Quartz).—See our XIIth Report, p. 231. They are prospects, in Upper Holcomb Valley. J. Burnap, of Los Angeles, owner.

Carbonate Mine (Quartz).—See our XIth and XIIth Reports, pp. 361 and 26. It is 1 mile E. of Oro Grande, at 3,000′ elevation. Although this mine produces chiefly a lead-silver ore containing some gold, there is a shoot of high-grade gold rock in the west shaft, now 250′ deep, which entitles it to a place among the gold mines. The rock is a mixture of granular quartz and calcite, rich in gold. T. J. Fleming et al., of Los Angeles, owners.

Center (*Livingstone*) *Mine* (Quartz).—See our XIIth Report, p. 231. It is 17 miles E. of Bear Valley Lake. It was closed down early in July, 1895. Morongo King Mining Co., of San Bernardino, owner.

Chippy Mine (Quartz).—See our XIth and XIIth Reports, pp. 367 and 231. The mine was formerly worked by lessees, but has been idle during the past year. J. P. Taggart, of Los Angeles, owner.

Christie Mine (Quartz).—See our XIIth Report, p. 231. It is near the head of Lone Valley, joining the Rose Mine on the west. The ore-shoot discovered in the Rose Mine, near the surface, was found to pitch west into the Christie, as depth was attained. The developments consist of a vertical shaft 190′ deep, with a 165′ cross-cut at the bottom to the ore-shoot, where drifts have been run E. and W., and a 50′ winze sunk. The workings connect with those of the Rose Mine. Pratt, Cullom, et al., of Glendora, owners.

Climax Mine (Quartz).—It is in Surprise District, 3 miles W. of Barstow, and near the line of the A. & P. R. R. The Climax is but one of a group of five claims. There are numerous other locations made, but their development is of the most superficial character. The Climax vein is 4″ to 10″ thick, strikes N.W., and dips S.E. A 60′ incline has been sunk. John M. Beckwith, of Calico, owner.

Coupon Mine (Quartz).—It is in Lone Valley, 45 miles E. of Victor, at 7,300′ elevation. It joins the Gem Mine on the north. A vertical shaft has been sunk 125′ to intersect the vein on its dip. Idle. Lizzie Christie, of Los Angeles, owner.

Courtwright & McDonald Mines (Quartz).—These are 15 miles S. of Danby, on Old Woman's Mountain, at 3,000′ elevation. The principal vein is 1′ to 3′ wide, on which a 200′ tunnel has been driven, and a 100′ shaft is now being sunk. There is no machinery on the mine. Courtwright & McDonald, of Danby, owners.

Coyote Holes.—See our XIIth Report, p. 231. The gold discoveries made here in 1894 did not prove as valuable as had at first been expected, and the claims located at that time have been abandoned.

Dry Lake District.—It is 55 miles E. of Victor. Some prospecting is being done there, but no mines of consequence are in active operation.

Eastern Districts.—In the eastern portion of this county are several districts where mining is carried on in a more or less desultory manner. The ores are mostly of good grade, but the cost of water and fuel is usually more than correspondingly high. The most prominent among these districts are *Exchequer*, *Ibex*, *Ivanpah*, *Mescal*, *New York*, *Old Woman's Mountain*, *Providence Mountain*, and *Shadow Mountain*.

Exchequer District.—See our IXth Report, p. 223. It is 15 miles N. of Homer. Some prospecting has been done in this district within the past two years, and some new claims located. No mines are in operation at present. The lack of water is a serious drawback to claims which are otherwise promising.

Falcon Mines (Quartz).—These constitute a group of seven claims in Upper Holcomb Valley, at 7,800′ elevation. The principal claim is the *Lucky Bill*, on which there are two veins: one 3′ wide, and one 6″ to 18″ wide. Two shafts have been sunk, 50′ to 100′ deep, respectively. A horse-whim has been put in place, and the work of development is to be continued. It is stated that a 5-stamp mill is soon to be erected. W. S. Arnold et al., of Los Angeles, owners.

Gem Mine (Quartz).—It is in Lone Valley, 45 miles E. of Victor, and joins the Christie Mine on the north. It has a 4′x 7′ two-compartment shaft, 90′ deep. There is no machinery on the mine. A. G. Watts, owner.

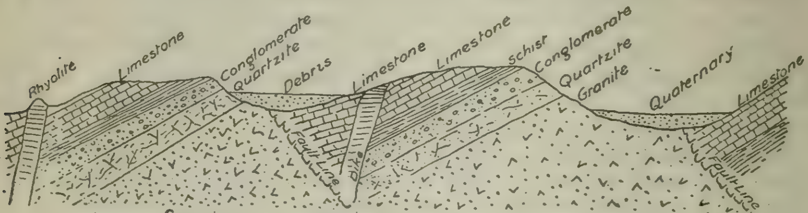
Gladstone Mine (Quartz).—See our XIth Report, p. 358. It is in Lava Beds District, 35 miles E. of Daggett. Idle. W. Steadman et al., of Daggett, owners.

Gold Bar Mine (Quartz).—See our XIth and XIIth Reports, pp. 367 and 231. It is at Vanderbilt, at 4,500′ elevation. See St. George.

Gold Bar Extension Mine (Quartz).—See St. George.

Gold Bronze Mine (Quartz).—See our XIth and XIIth Reports, pp. 367 and 232. It is at Vanderbilt, at 5,000′ elevation. The main shaft is 280′ deep. There is also an air-shaft, 100′ deep. The property has a steam hoist and 10-stamp steam-power mill. The mine is idle, and in litigation. J. K. Patton et al., of Vanderbilt, owners.

Gold Chief Mine (Quartz).—This property, comprising a group of seven claims, is situated 6 miles W. of Manvel, the present northern terminus of the Nevada Southern R. R., at 5,700′ elevation. The mines are at the extreme southwest end of the New York Mountains. The geology of the locality is simple, consisting of quartzites, in part conglomerate, mica schist, and limestones, resting on a mass of intrusive granite. The quartzite forms the basal stratum of the sedimentary series, and is the principal gold-bearing rock, though gold also occurs in the schists, and more sparingly in the conglomerates. The sedimentary rocks have a curving strike around the granite core of the New York Mountains, and in this locality have an approximate dip at about 30° S.W. Dikes of rhyolite and felsite have intruded the sedimentary rocks, and the topography of the region in the vicinity of the claims suggests the probability of faults. (See New York Mountains.) The *Gold Chief* is the principal claim, and has several hundred feet of development. A cross-cut tunnel has been driven through the granite to the quartzite, and a 60′ winze sunk on the contact, which is found rolling. A drift, 200′ long, follows along or near the contact from the foot of the winze, and several diagonal cross-cuts have been made on the same level, through the lowest stratum of quartzite into the conglomerate. Surface prospecting indicates that the underground workings have not penetrated all the gold-bearing formation. The quartzites, conglomerates, and schists are found to contain gold in many places across a zone of over 200′ in width. It is not claimed that all of this is pay-rock, but the present developments do not determine the possible extent and value of the gold-bearing deposits. There is no machinery on the property, and water is very scarce in the district. A well has been sunk in the wash near the mine, but no water obtained. Robert Young et al., of Manvel, owners.



SECTION OF NEW YORK MOUNTAIN.

Golden Eagle Mine (Quartz).—It is a prospect, 2½ miles S.W. of Vanderbilt. The quartz occurs in large vein-like masses in limestone, and contains much specular iron and some copper carbonate and gold. Charles Smithson, of Vanderbilt, owner.

Golden Queen Mine (Quartz).—It is in the Providence Mountains. See Hidden Hill.

Gold Mountain Mines (Quartz).—See our XIIth Report, p. 232. They comprise a group of claims 40 miles E. of Victor and 5 miles N.E. of Bear Valley Lake, at 7,800′ elevation. The property has a large amount of superficial development, in the form of open cuts. The gold occurs in quartzite, which lies like a cap on the summit of the hill. The underlying formation is granite and gneissoid rocks. E. J. Baldwin, of San Francisco, owner.

Goldstone District.—See our XIIth Report, p. 232. It is in the Providence Mountains, 30 miles N. of Fenner. The excitement created in 1894 by the finding of rich gold rock in that region appears to have subsided, and all the mines are idle.

Gopher Mine (Quartz).—It is a prospect, 2 miles N. of Vanderbilt, having only superficial development. A. A. Banning, of Vanderbilt, owner.

Green Lead Mine (Quartz).—It is 3 miles W. of Holcomb Valley, at 7,600′ elevation. After an idleness of years it is being reopened and a

Royal Rock Mine.

Steam Shovel at Holcomb Valley Mine.

tunnel run for further development. Richard Garvey, of San Gabriel, owner.

Gulch Mines (Quartz).—These claims, two in number, are in Jacoby Gulch, 35 miles E. of Victor and 1 mile S. of Cactus Flat, in Black Hawk District. A shaft has been sunk 30′ on a 3′ vein, which strikes N.W. and dips N.E. J. C. Johnson, of Victor, owner.

Hidden Hill Mine (Quartz).—It is on the eastern slope of Providence Mountains, 20 miles N. of Fenner Station, at 4,000′ elevation. The property comprises a group of five claims, of which the *Golden Queen* and *Hidden Hill* are the most important. The veins are small, 1″ to 8″ wide. The quartz is crystallized and some of it is rich in gold, containing also a small amount of chalcopyrite and iron oxide. The quartz of lower grade is crushed in a 2-stamp mill run by a gasoline-engine. The deepest workings are but 35′ from the surface. Monoghan & Murphy et al., of Needles, owners.

Holcomb Valley District.—See our Xth Report, p. 523. It is in the San Bernardino Mountains, 25 miles S.E. of Victor. Several quartz claims, which have long been idle, are being reopened, and it is now thought that, with the improved conditions, these mines may be made to pay. The Holcomb Valley Co. has done a vast amount of work during the past two years also. The gold-bearing quartzites of the district are again receiving attention.

Holcomb Valley Co.'s (Limited) Mine (Placer).—See our Xth and XIIth Reports, pp. 520–523, and 233. This company has been operating for several years past in Holcomb Valley and has expended a very large sum of money in prospecting, machinery, experiments, etc. A dredging machine (steam shovel) has been employed for three years past, but it has been found that the quantity of gold in the gravel is too small to make such extensive operations remunerative. Fully 3,000′ of trench, averaging 16′ wide and 8′ deep, has been excavated during the past two years with the shovel. Water for sluicing has to be pumped from wells; the amount of "stripping" required is usually large, and the grade of the valley insufficient to make mining on a large scale possible. A great many prospect shafts, 10′ to 40′ deep, have been sunk the past year, and at one point quite extensive drift-mining operations have been undertaken; the gravel being raised on an incline by steam-power and dumped into the bins, from which it is "fed" into sluices. A great deal has been said and written about the advisability of driving a long tunnel through the mountains on the north rim of the basin for the purpose of draining the valley and affording an outlet for tailings, etc.; but considering the small grade within the valley itself, this plan does not seem feasible. Holcomb Valley Co. (Ltd.), of London, owner; J. R. Thame, of Victor, superintendent.

Holcomb Valley Mining Co. (Quartz and Placer).—See our XIIth Report, p. 233. Their property is in Upper Holcomb Valley. The operations in progress here two years ago have been suspended, and all the mines are idle. Holcomb Valley Mining Co., of Los Angeles, owner.

Hong Kong Mines (Quartz).—These are 2 miles N. of Vanderbilt, at 4,000′ elevation, and include the *Gopher* and *Last Chance* claims. The deepest shaft is a 40′ incline. A. A. Banning, of Vanderbilt, owner.

Ibex Mine (Quartz).—See our XIth and XIIth Reports, pp. 368 and 233. It is 11 miles N. of The Needles and 3 miles E. of Marriner Station, on the A. & P. R. R. After a period of idleness in 1895, prospecting was resumed in 1896, and some very encouraging developments made. A 10-stamp, mill situated at the railroad, is connected with the property. Ibex Mining Co., of Los Angeles, owner; C. E. Marriner, of Los Angeles, superintendent.

Iron Mine (Quartz).—It is ½ mile S. of Vanderbilt, at 5,000′ elevation, and is one of the claims in the *Boomerang* group. It has a 60′ vertical shaft. A. G. Campbell, of Salt Lake, owner; G. Nay, of Vanderbilt, superintendent.

Irvington Mine (Quartz).—It is 10 miles N.E. of Oro Grande, at 3,450′ elevation. It is a new prospect, on which two 12′ shafts have been sunk on a small vein in granite. J. R. Conser and J. D. Jones, of Victor, owners.

Ivanpah District.—See our IXth and Xth Reports, pp. 238 and 531. It is 25 miles N. of Vanderbilt. The district became famous some years since by reason of the discovery of high-grade silver ores. Gold prospects have been found more recently, and prospectors are at work developing some of the claims.

Last Chance Mine (Quartz).—See Hong Kong.

Lava Beds District.—See our IXth, Xth, and XIth Reports, pp. 224, 529, and 349. It is 36 miles E. of Daggett. Most of the mines are silver and copper producers, but gold claims are also located, though at present idle.

Little Lottie Mine (Quartz).—It is a prospect 10 miles E. of Oro Grande, at 3,450′ elevation. A 12′ shaft has been sunk on a vein in granite. Orin Staples, of Victor, owner.

Lookout Mine (Quartz).—It is one of the claims in the Black Hawk District. See our IXth, Xth, XIth, and XIIth Reports, pp. 226, 523, 364, and 230. It has several hundred feet of tunnels and stopes, all in crushed limestone, which contains gold associated with hematite. Cook & Leach, of Victor, owners.

Lucky Bill Mine (Quartz).—See Falcon.

Lytle Creek Mines (Placer).—See our XIIth Report, p. 233. The usual amount of placer-mining is done annually on this stream.

McFarland's Mine (Quartz).—It is 12 miles N.E. of Blake, in Exchequer District, at 3,500′ altitude. A shaft has been sunk 135′ on the vein, 3′ to 4′ wide, which is gold-bearing. It is claimed by the owner that the shoot was lost in sinking, and work was discontinued. Whether the vein pinched or faulted was not known; faults, however, are very common in other mines in this district. Water is very scarce in the district. This mine is idle. Wm. McFarland, of Vanderbilt, owner.

Mescal District.—See our Xth Report, p. 531. It is 20 miles N.W. of Vanderbilt. After a long period of idleness, this district was again the scene of active prospecting the past year. The veins contain gold and copper.

Monarch Mine (Quartz).—It is near the old Oro Grande Mine, 7 miles N.W. of Oro Grande, at 4,150′ elevation. The vein is from 2″ to 2′ wide, and has been opened by an incline 30′ deep. The vein strikes N.W., and dips 30° N.E. It has no machinery, and is idle. Dr. Coliver et al., of San Bernardino, owners.

Morongo Mining Co.'s (*Rose*) *Mine* (Quartz).—See our IXth and XIIth Reports, pp. 226 and 234. It is 45 miles N.E. of Victor, at 7,200′ elevation. The ore-shoots within the limits of the Rose claim are said to have been exhausted, the ore in its descent having pitched into the

Christie Mine, on the west. Admission to the mine and all information were refused, but judging from the condition of the mine at the time of a former inspection, there is no reason to discredit the above report. It is said that a cyanide plant of 50 tons daily capacity will be erected shortly, in connection with the Christie Mine. Morongo Mining and Milling Co., of Riverside, owner; K. D. Shugart, of Victor, superintendent.

Morongo King (*Center or Livingston*) *Mine* (Quartz).—See our VIIIth, IXth, Xth, and XIIth Reports, pp. 504, 226, 526, and 231. This property has been abandoned and the 10-stamp mill removed.

Needles Reduction Works.—They are on the bank of the Colorado River at Needles, and consist of crushing rolls, a system of elevators and conveyers, a Bryan mill, etc. It is a milling and not a reduction plant, and never was successfully operated. Owners unknown.

New York Mountains.—They are an extension of the Providence range, though disconnected. Veins and mineral deposits occur at several places in the sedimentary rocks which flank the main granitic core. The axis of the range is N.E. and S.W. The geology of the region is simple: The nuclear mass of the range is grano-diorite, which has uplifted the older sedimentary rocks on its flanks, the upper portion or dome of the great anticline having been eroded, leaving only the very rugged line of serrated peaks and ridges flanked on both sides and about the ends of the range by quartzites, limestone, mica schist, and conglomerates. On the eastern side are found numerous copper deposits in the limestone, the principal ore of which is chrysocolla. The silver ores of New York District also are found in the limestone, associated with low-grade copper ores. On the northeast end of the range, in low foothills, really independent of the main uplift in old crystalline schists, probably much older than the granite, are the fissure veins of the Vanderbilt District. North of the main range, in granite, which is a portion of the great mass of New York Mountains, are large quartz veins containing small amounts of gold and sulphide copper ores. On the west side and southwest end of the range gold is found in several places in the quartzite which forms the basal stratum of the sedimentary series. These quartzites are conglomerate in part, though the conglomerate is not at the base. They are found to be gold-bearing also, though of lower grade than the quartzites. The gold in the quartzites is evidently the result of impregnation, and was not deposited contemporaneously with the conglomerates. (See Gold Chief Mine.) A variety of eruptive rocks have intruded the sediments at many places, and local faults and folds are numerous.

Nonpareil Mine (Quartz).—It is 12 miles N.E. of Blake Station, in Exchequer District, at 3,500′ elevation. The ore contains both gold and copper. But little development work has been done. Cram & Miller, of Vanderbilt, owners.

Old Dominion Mine (Quartz).—It is in Exchequer District, 12 miles N.E. of Blake, at 3,500′ elevation. The vein strikes N.W., dips 45° N.E., and has a 30′ incline and several surface cuts. Cram & Miller, of Vanderbilt, owners.

Old Woman's Mountain.—See our IXth Report, p. 217. Veins of gold and silver ores and also silver-lead ore are found in this range. A group of claims is being worked at the north end of the range, 8 miles S.E. of Danby. See Winton Mines, also Courtright & McDonald Mine.

Old Woman's Springs.—See our XIIth Report, p. 234. The alleged discoveries of gold in the scoriaceous basalt at and near the springs have been proved to have no foundation in fact. Some prospecting has been done in the vicinity in granitic rocks and limestone, and it is reported gold has been found.

Opera Mine (Quartz).—It is in the Black Hawk District, 35 miles E. of Victor, at 6,500′ elevation. The mine is situated high up on the mountain side and can be reached only by a winding trail. Gold occurs with hematite in bunches and veins in limestone. Since our last Report considerable work has been done and a carload or more of high-grade ore shipped. The owner is engaged in getting out another carload. O. G. Leach, of Victor, owner.

Ord District.—See our IXth, Xth, and XIIth Reports, pp. 226, 528, and 234. It is in Ord Mountain, 14 miles S.E. of Daggett. Some development work has been done on the gold veins of the district the past two years.

Oro del Fino Mine.—It is at Vanderbilt. See St. George.

Oro Grande District.—See Silver Mountain District.

Oro Grande Mine (Quartz).—See our IXth Report, p. 227. It is 7 miles N.E. of Oro Grande, at 4,100′ elevation. Some years since a large amount of work was performed here on a vein, 1′ to 4′ in width. The main incline is 200′ deep. At 100′ from the surface the vein is displaced by a normal fault, the hanging-wall side having moved downward 30′ or thereabouts. The vein was followed down to the fault plane, where the miners, mistaking the fault for the vein, followed the former some distance, but found the faulted vein in drifting, just below the fault line. All machinery has been removed and the mine is idle. Oro Grande Mining Co., owner.

Orphan Boy Mine (Quartz).—It is in Exchequer District, 12 miles N.E. of Blake, at 3,500′ elevation. The ore contains gold and copper of good grade. Its development is superficial. Cram & Miller, of Vanderbilt, owners.

Osborne Placers.—See our XIIth Report, p. 234. They are in Upper Holcomb Valley, at 7,600′ elevation. Idle. J. B. Osborne, of Daggett, owner.

Pathfinder Mines (Quartz).—They are 22 miles N. of Hinckley Station, and comprise a group of six claims on parallel veins, 600′ apart, striking E. and W., and dipping 40° S. There are four shafts, 20′ to 80′ deep, and numerous small cuts. The veins are from 2′ to 3′ wide. Y. R. Stevens, of Hinckley, owner.

Providence Mountains District.—See our IXth, Xth, and XIIth Reports, pp. 223, 519–532, and 235. It includes the Providence range of mountains, and was at one time a field of active operations. The Bonanza King Mine, which first gave the region fame, has been idle many years. More recently, discoveries of rich quartz rock have again attracted attention to the region. See Hidden Hill and Toughnut.

Queen of Night Mine (Quartz).—See our XIth and XIIth Reports, pp. 367 and 237. It is at Vanderbilt, at 5,000′ elevation. There are two shafts, 75′ and 180′ deep respectively, and several open cuts on the vein. The vein is from a few inches to 2′ thick, and in the ore-shoot is quite rich, considerable ore having been shipped. A cross-vein also is found on the claim, upon which a cut and tunnel have been made, and some extremely rich quartz found. The ore is raised from the mine by means of a horse-whim, sorted, sacked, and shipped to Eastern reduction works. It contains gold, silver, lead, copper, iron, and zinc. The vein sends out numerous branches into the walls, which are coarsely crystallized gneissoid rocks, with dikes of pegmatite. J. K. Patton, of Vanderbilt, lessee.

Red Cloud Mines (Quartz).—These claims, including also the *Blue Jacket* and *White Cloud*, are on the west side of New York Mountains, 9 miles N.W. of Manvel. They are similar to the mines of the Gold Chief group (q. v.), but have little development. Robert Young et al., of Manvel, owners.

Red Pencil Mine (Quartz).—It is 10 miles E. of Oro Grande, at 3,450′ elevation. This claim and others near it were discovered in the spring of 1896, and considerable prospecting done. The Red Pencil vein strikes N. 80° W. and dips S. A shaft was sunk 27′ on the vein, which at the bottom is faulted. At 100′ distance a second shaft was sunk 40′ vertically, and developed nothing. Further prospecting will be done to discover the vein, if possible, below the fault. Orin Staples, of Victor, owner.

Rose Mine (Quartz).—See Morongo Mining Co.

Royal Mine (Quartz).—See Alvord.

Royal Rock Mine (Quartz).—It is 7 miles N.E. of Oro Grande, and about ½ mile E. of the Oro Grande Mine. An inclined shaft has been sunk 200′, at an angle of 35° to 45°. The rock formation is a massive chloritic rock, probably altered diorite, through which occur irregular masses, vein-like sheets, and veinlets of quartz containing auriferous iron sulphurets. The rock greatly resembles that of many mines in Calaveras and Amador counties. There are no selvages or well-defined walls, unless such should be found beyond the limits of the shaft. No cross-cutting has been done. It is the best-equipped shaft in this portion of the desert. Hunt & Alexander, of Oro Grande, owners.

St. George Mines (Quartz).—See our XIth and XIIth Reports, pp. 367 and 232–236. These mines constitute a group of claims at Vanderbilt, at 4,500′ elevation. These are the *Gold Bar*, *Gold Bar Extension*, and *Oro del Fino*, located on a single vein, which is opened at numerous places by cuts and trenches. There are five shafts, sunk at an angle of about 75°, which are 65′, 75′, 76′, 180′, and 300′ deep, respectively. The deepest shaft is equipped with steam hoist, the others with horse-whims or windlasses. There are several levels connecting the two deepest shafts. The vein is of the branching type, having the gneissoid rocks of the district usually on one wall and a light gray dike rock on the other. The dike sometimes forms both walls for some distance, or it may be found on the hanging or foot wall only. The tendency of the vein to form lenticular ore-bodies which overlap, with from 1′ to 10′ of heavy gouge (crushed country rock) between the lenses, is strongly marked. Considerable stoping has been done. It is now being worked under lease. The ore is hauled to the Boomerang mill, 1 mile distant. John W. Mackey et al., of New York, owners; A. G. Campbell, of Salt Lake, lessee.

Santa Fe Mine (Quartz).—It is one of the claims of the Black Hawk group, in which high-grade gold rock occurs, chiefly hematite with copper glance in limestone. Cook & Leach, of Victor, owners.

Scoopendike Mine (Quartz).—It is in Upper Holcomb Valley, at 7,000′ elevation. The vein strikes N.W., and dips 60° N.E. It is 4′ wide, with a 2′ streak of iron and copper sulphide, containing gold and silver. An 80′ incline has been sunk. H. Gates, of Victor, owner.

Shadow Mountain District.—In 1894 some rich gold quartz was discovered in Shadow Mountain District, 55 miles N.W. of Vanderbilt. The small size of the veins, some of which are faulted, the great distance from supply points, and the scarcity of water, have retarded the development of the mines, and the district is practically deserted.

Silver Mountain District.—See our IXth, Xth, XIth, and XIIth Reports, pp. 224, 527, 363, and 25. This district is more commonly known as the Oro Grande District, though organized as Silver Mountain District. It embraces a large territory and includes gold, silver, and copper mines, and marble and granite quarries. There are several mines in the district shipping lead-silver and "dry" gold ores.

Sidewinder Mine (Quartz).—See our IXth, Xth, and XIIth Reports, pp. 227, 527, and 235. It is in Silver Mountain District, 12 miles N.E. of Oro Grande, at 4,500′ elevation. When the inclined shaft had reached a depth of 350′ all operations were temporarily suspended, pending the erection of a larger hoisting plant. Charles Weir et al., of Los Angeles, owners; J. Driskill, of Oro Grande, superintendent.

Silver Reef District.—See our XIth and XIIth Reports, pp. 365 and 377. It is 40 miles E. of Victor, and N.E. of the Black Hawk group of mines. The mines on the "reef" are principally silver, but high-grade gold rock has recently been found in the silver mines, and it is reported, also, to have been found about half way between Silver Reef and Old Woman's Springs, 2½ miles distant.

Sunrise Mine (Quartz).—It is in Ord Mountain District, and has several hundred feet of drifts, winzes, and open cuts on the surface. The vein occurs in a large diorite dike, along a zone much crushed and broken. The fissures are branching and numerous, and within this zone of crushing the mineralization has taken place. J. B. Osborne, of Daggett, owner.

Surplus Mine (Quartz).—It is near the Rose Mine, at the head of Rattlesnake Cañon, at 7,000′ elevation. It has a 75′ vertical shaft. A. G. Watts, of Victor, owner.

Surprise District.—It is 4 miles W. of Barstow, on the north side of the Mojave River. In 1895 some rich quartz rock was found in the district and a large number of claims located, on many of which superficial development work has been done. The veins are mostly small, 2″ to 10″ wide, and in some of them the rock is high-grade, showing gold. The formation is a coarsely crystallized gneissoid rock, in which hornblende and feldspar are prominent, the latter being much kaolinized and the hornblende mostly altered to chlorite, epidote, etc. Large dikes of quartz-porphyry traverse the country in a N.W. direction. Granulite also occurs in an immense dike. These intrusive dikes appear to have no direct relation to the gold-bearing veins. The veins are fissures striking N.W., and dipping 20° to 90° N.E. The gold occurs in quartz and a purplish-brown iron ore, derived from the oxidation of pyrite. Some of the deposits contain considerable copper, sulphide, and carbonate. Limestone is found on the northern border of the gold region. Four miles northwest, galena and lead carbonate, with silver, and also some rich chloride of silver ore, are found. See Climax Mine.

Swarthout Mine (Quartz).—It is in Badger Cañon, 7 miles N. of the City of San Bernardino, at 3,000′ altitude. A tunnel has been driven 300′ on a vein that dips at an angle of 15° into the mountain, in gneissoid granite. Swarthout Bros., of San Bernardino, owners.

Toughnut Mine (Quartz).—It is in the Providence Mountains, 30 miles N. of Fenner, and 2 miles from the Bonanza King Mine, at 3,800′ elevation. The vein is small and strikes N.E.; it is vertical. The mine has a 60′ shaft and superficial workings. Charles A. Stilson et al., of Los Angeles, owners.

Valencia Hill Mines (Quartz).—They are in Holcomb Valley District, 35 miles E. of Victor, and 1½ miles W. of Gold Mountain. The gold occurs here in quartzite similar to that at Gold Mountain. The massive quartzite is found crushed in broad zones, the main fractures of which are parallel, or nearly so, and which sometimes conform to the bedding planes. The harder, more massive rock is found to contain pyrite, and is also gold-bearing. The past summer considerable exploration work was being done, and a 5-stamp mill erected for the purpose of thoroughly testing the mines. The quartzite of this district is undoubtedly of the same geological age as that at Oro Grande and at the southwest end of New York Mountains; in the Gold Chief Mine, and at other localities in this county. The quartzite has been found to be gold-bearing in several localities. S. Baird, of Victor, owner.

Vanderbilt District.—See our XIth and XIIth Reports, pp. 367 and 235. It is 4 miles N.E. of Manvel, the northern terminus of the Nevada Southern R. R., at about 5,000′ elevation. The principal mines in the district are the *Boomerang*, *Gold Bronze*, *St. George Group*, and *Queen of Night* (q. v.). The activity which formerly characterized mining operations in this district is now lacking, but few of the mines are being worked, and the population has greatly decreased. All the mines of the district that are in operation are in the hands of lessees, with the single exception of the Boomerang.

Webster Mine (Quartz).—See our XIIth Report, p. 237. It is at Vanderbilt, and forms a part of the Boomerang vein system, being an offshoot of the latter. The vein strikes N. 85° E. and dips 45° N., and though it is small has been one of the best-paying veins of the district. It has been quite extensively worked by lessees, who have taken out quite a large amount of high-grade ore, most of which has been shipped to Eastern reduction works. A. G. Campbell, of Salt Lake, owner.

Whatnot Mine (Quartz).—See our IXth Report, p. 228. It is 7 miles N.E. of Oro Grande, at 4,000′ elevation. The vein strikes N. and S. and dips nearly vertically. An adit has been run 300′ on the vein, connected at two points with the surface by upraises. Considerable stoping has been done above the level. A winze has been sunk 125′ in the tunnel and at 100′ depth a level run, from which stopes have been carried up 40′ or more. The vein is 6″ to 12″ wide, but produces high-grade rock, which is shipped. H. P. Lemmert, of Los Angeles, owner; Morgan & Keith, of Oro Grande, lessees.

Winton Mines (Quartz).—They are on the north end of Old Woman's Mountain, 7 miles S.E. of Danby, at 4,000′ elevation. There are thirteen claims in the group, only one of which has any development. The vein is in granite, strikes E. and W., and dips vertically. A cross-cut tunnel has been driven to the vein and a level opened along it, connecting with an upraise to the surface. The total workings do not exceed 150′. There are also several surface cuts on the vein, which is 1″ to 10″ wide. The quartz is packed down the mountain on burros to the mill, 1,000′ below. The mill has 2 stamps of 850 lbs. each, with discharge openings on three sides. Power is furnished by a gas-engine. Water is obtained from springs in a neighboring cañon. E. Kennedy, of Pasadena, owner.

MILLS IN SAN BERNARDINO COUNTY.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of Each, in Lbs.	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
					No.	Character.	No.	Capacity.		
Altuma	Steam	10	850							
Alvord		5	850							
Barbero	Steam	10	900	30						
Bonanza King		10								
Boomerang		10	850	15–20						
Falcon (will build 5-stamp mill)										
Gold Bronze		10	750	10	(Bumping Tables.)					
Hawley	Steam	10	700	25						
Hidden Hill	Gas	2	850	3						
Ibex		10	850							
Ivanpah		10								
Langtry		5	850							
Oriental	Steam	30	850	90	(Boss process of amalgamation.)					
Oro Grande	Water	10								
Rose	Steam	5	850	12						
Silver King	Steam	30			(Boss process of amalgamation.)					
Valencia Hill		5	850							
Waterloo	Steam	15	850		(Boss process of amalgamation.)					
	Steam	60	850		(Boss process of amalgamation.)					
Winton	Gaso.	2	850	3						

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN SAN BERNARDINO COUNTY.

Name of Mill or Mine.	Power.	Number	Character.	Diameter	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Plant, Size.
						No.	Character.	No.	Capacity.		
Cal. Portland Cement Works		4	Griffin		150						
Needles Reduction Works			Bryan								

San Diego County.

This county has shared liberally in the increasing interest in mining affairs within the past two years. A large portion of the county consists of desert, but in nearly every hill and range rising above the barren, sandy plains are found veins and ore-deposits, some of which are phenomenally rich in gold. The Golden Cross Company owns a large tract of mineral land in the Cargo Muchacho Mountains, and since our last Report have added a 100-stamp mill to their already large plant. This property, situated in the Colorado Desert, has attracted much attention from outside the State, and in the vicinity a number of new enterprises have been inaugurated. Encouraging results have been obtained in the Picacho District, 30 miles north of Fort Yuma, on the Colorado River. In that portion of the desert lying north and east of the S. P. R. R. numerous prospectors are scouring the mountains in search of new veins, or working on those already discovered. The Julian District and the various mining fields along the Cuyamaca range continue to add to the output of gold. In the vicinity of Escondido there has been considerable prospecting done on large deposits of mineralized rock. The valleys of this county, which lie between Cuyamaca range and the ocean, are picturesque and of unsurpassed fertility, and horticulture is of much importance. The region along the coast enjoys the reputation of having the most phenomenally equable climate in the State.

Able Mine (Quartz).—It is a new prospect in Crescent Valley, 7 miles S.W. of Escondido, at 400′ elevation. It occurs as a segregated vein in a mass of shattered and crushed diorite. There are two shafts, 25′ and 35′ deep respectively. S. P. Able, of Escondido, owner.

Albert Polhamus Mine (Quartz).—See White Gold Basin.

Alcyon Mine (Quartz).—See White Gold Basin.

Alfonso Mine (Quartz).—See White Gold Basin.

American Girl Mine (Quartz).—It is in the Cargo Muchacho Mountains, 23 miles N.W. of Yuma, and is a new prospect, in which a 200′ incline has been sunk and several levels run. Some good quartz has been encountered. Johnson & Lohman, of Hedges, owners.

Antelope Mine (Quartz).—See our XIth and XIIth Reports, pp. 380 and 238. It is 1½ miles N.W. of Banner, at 3,500′ elevation. The main tunnel is 420′ long. The 100′ shaft is now caved. A small force of men is at work. Bailey Bros., of Banner, owners.

Apache Mine (Quartz).—See Picacho.

Artery Consolidated Mines (Quartz).—This group, comprising three claims, is 2 miles S. of Dulzura, at 1,300′ elevation. The gold-bearing quartz is found in a large felsitic mass along a zone of crushing. The main tunnel is 400′ long. A cross-cut tunnel has been driven 45′ and several shafts, 15′ to 30′ in depth, sunk along the lode. An arrastra has been built, and will be run by a gas-engine. Stuart Donohue, of Dulzura, owner.

Banner Mines (Quartz).—This property comprises a group of claims at and near Hedges, 25 miles N.W. of Yuma. The principal claims are the *Nana* and *Overlook*. On the former a 110′ shaft was sunk and abandoned. The Overlook lies at 500′ elevation, and a vertical shaft, now 285′ deep, is being sunk. It is stated that it is the intention to sink to the *Golden Queen* shoot of the Golden Cross Company, which is presumed to pass under the surface of the Overlook ground, and in the event of finding it within the lines of the latter claim the Banner Company will contest the extra-lateral rights of the Golden Cross Company, basing their idea on the theory that these ore-deposits (if they may be called such) belong to a class known as bedded deposits, and not veins. Banner Mining Co., of Denver, Colo., owner; H. B. Adsit, of Hedges, superintendent.

Bay View Mine (Quartz).—See our XIIth Report, p. 238. See Noble Group.

Bertha Mine (Quartz).—It is 12 miles E. of Banner, in Rice District, at 3,800′ elevation. A shaft has been sunk 25′ and a tunnel driven 75′ on the vein. The vein is large and well defined, and is apparently on the same fissure as the N. G. Mine. Rice Bros., of Warner, owners.

Beyers Mines (Quartz).—They are near Deer Park, 9 miles N.E. of Descanso, at 4,500′ elevation. They are named the *Cascade*, *Combination*, *Corporal*, *Hermit*, *Matamore*, and *Spike*. Each of them has some superficial development. A water-power arrastra was built some years ago, since which time a 2-stamp water-power mill has been erected. Idle. John Y. Beyers, of Descanso, owner.

Black Eagle Mine (Quartz).—See our XIth and XIIth Reports, pp. 382 and 238. It is at Mesa Grande, 1 mile N. of Rancheria. A 20′ shaft and some superficial workings are the only developments. When first discovered this quartz was very rich in gold. Hinckle & Co., of San Diego, owners.

Bloodstone Mine (Quartz).—It is a prospect 4½ miles E. of Escondido, at 1,200′ elevation. It has a 25′ vertical shaft. H. C. Brown et al., of Escondido, owners.

Blossom Mine (Quartz).—See our XIIth Report, p. 238. It is 20 miles N.W. of Yuma, in the Cargo Muchacho Mountains, at 400′ elevation. It has a 280′ incline sunk on a mass of chloritic rock, altered from coarse granular diorite. It contains a small percentage of iron sulphuret. A 10-stamp mill has been built to crush this rock. Idle. Blossom Gold Mining Co., of Los Angeles, owner.

Bobtail Mine (Quartz).—See Noble's.

Bonnie Belle Mine (Quartz).—It is 12 miles E. of Banner, in Rice District, at 3,700′ elevation. The vein is from 2′ to 10′ wide, and occurs in a series of swells. A 15′ shaft and several superficial cuts have been made on the vein, which strikes E., and dips 80° N. Chatam Helm et al., of Warner, owners.

Bottle Peak Mine (Quartz).—It is 4 miles E. of Escondido, at 1,670′ elevation. The vein strikes N.E., and dips 32° N.W. It is apparently a continuation of the fissure system of the old Escondido Mine. The vein, 2″ to 20″ wide, occurs in grano-diorite. An incline has been sunk 55′, which exposes a somewhat irregular "splicing" or overlapping vein, accompanied by a much decayed, dark-colored rock, evidently diorite. W. P. Bevington, of Escondido, owner.

Buena Vista Mine (Quartz).—It is near the Colorado River, 30 miles above Yuma. Several shafts and cuts have been made on the vein and levels run at various points. The deepest workings are about 200′ from the surface. After an idleness of many years, work was resumed the past summer.

Cable Mine (Quartz).—It has been consolidated with the old *Fraction* and *Treasury* claims, and is ¾ mile N.W. of Banner, at about 3,300′

elevation. The principal development is on three adit levels, which are 217′, 160′, and 330′ long respectively, the last being the lowest. Considerable stoping was done in the upper levels years ago, and it was to reach the shoot that the lowest tunnel was driven, which has already encountered two separate shoots. The quartz is similar to that found in the other mines of this district, a granular, rather glassy rock, with some disseminated pyrite, and often rich in gold. Venturina Mining Co., of San Diego, owner; A. P. Frary, of Banner, superintendent.

California Picacho Mine (Placer-Hydraulic).—See our XIIth Report, p. 238. It is 60 miles by river above Yuma and 27 miles N. from Fort Yuma, in Picacho Basin. The expensive pumping plant is located within a few yards of the Colorado River. The mines are situated 500′ higher, and 4 to 5 miles back from the river. The pumps proved inefficient. The reservoir from which it was expected to derive pressure is simply a wooden tank holding about 3,000 gals., and giving 50′ to 75′ pressure. The sluice grade is light, being about 100′ per mile. The primary cause of the trouble seems to have been the inefficiency of the pumping machinery and a lack of practical knowledge on the part of the management. A score of Mexicans are at work almost the year round, with dry-washers, in the gulches of the district.

Cargo Muchacho District.—It is 15 to 22 miles N.W. of Yuma; the nearest railroad station being Ogilby, on the Southern Pacific. The entire range consists of highly silicious metamorphic rocks, some of which may be of eruptive origin; notably a grayish-green, granular diorite at Hedges. These rocks throughout the range are intruded by a network of pegmatite dikes of irregular shape and size, some of which are gold-bearing; notably in the Golden Cross and Cargo Muchacho mines. The mountain range is divided into two distinct and separate portions, though having their axes in a common direction; that is, N.W. and S.E. A broad cañon separates the two portions of this range. The southeast portion of the range is made up of rather coarse-grained, grayish-green, crystalline rocks. These are intruded by diorite dikes, and at one place is found a large zone of schist, in which cyanite (an aluminous silicate of sky-blue color) occurs abundantly. Most of this portion of the mountain range seems to be metamorphic eruptive rocks, including also rocks of sedimentary origin, quartzite, mica-schist, etc. The northwest portion of the range consists chiefly of hornblende-schist, mica-schist, and massive diorite; the whole mountain mass being a network of the coarse-grained granite veins above referred to. In the latter range is found the immense gold-bearing bedded and similar deposits of the Golden Cross system. The dip of the strata is S.W., and to this the gold-bearing masses conform. This dip would indicate that the rocks of the region above Hedges, in the Golden Cross mines, would dip beneath the region forming the southerly portion of the range. It is not evident whether the plainly marked division between the two sections of the range is the result of a fault and displacement or not. The rocks of the region about the Cargo Muchacho Mine, south of the cañon, disintegrate more rapidly, apparently, than the harder-grained rocks about Hedges. The veins of the southern section are mostly fissures filled with quartz and sulphide minerals, containing gold. Faults and displacements are of frequent occurrence in both groups of hills.

Cargo Muchacho Mine (Quartz).—See our VIth (Part I), XIth, and XIIth Reports, pp. 81, 385, and 239. It is 4 miles from Ogilby and 16 miles N.W. of Yuma. Idle past two years. Paymaster Mining Co., of Yuma, owner.

Cascade Mine (Quartz).—See Beyers.

Chaparral Mine (Quartz).—See our XIIth Report, p. 239. It is 2½ miles S.E. of Julian. W. W. Boswell, of San Diego, owner.

Chief of the Hills Mine (Quartz).—See our XIth and XIIth Reports, pp. 382 and 239. It is in Dulzura District, 30 miles E. of San Diego. M. O'Reilly, of San Diego, owner.

Cincinnati Belle Mine (Quartz).—See our XIth and XIIth Reports, pp. 380 and 239. It is 1 mile N.W. of Banner, at 3,500′ elevation. The vertical shaft is now 230′ deep, and supplied with a steam hoisting plant. Banner Gold Mining Co., owner; Horace Crinklaw, of Banner, superintendent.

Clark Mine (Quartz).—It is 9 miles N.E. of Descanso, at 4,000′ elevation. There is quite a large amount of superficial development, and a good grade of rock is extracted, which is reduced in a water-power arrastra. — Clark, of Descanso, owner.

Clifton Mine (Quartz).—It is 9 miles S.W. of Escondido, at 400′ elevation, and comprises a tract of 80 acres. The deposits or ore-shoots occur in the broad zones of crushed felsite. It is heavily mineralized and stained with iron oxides. Several open cuts and short tunnels have been driven into the hill. The ore-shoots strike N. 15° W., and dip 80° N.E. The formation in the vicinity is grano-diorite, giving place to a large eruptive formation nearly a mile wide, consisting of felsite and felsitic breccia, the fragments of which are found to become larger going eastward. These rocks continue to the Bernardo River, when a gray diorite succeeds it. Q. R. Smith et al., of Santa Ana, owners.

Combination Mine (Quartz).—See Beyers.

Comet Mine (Quartz).—It is 2 miles S. of Dulzura, at 1,600′ elevation. It has several short tunnels and surface cuts. Idle. S. H. Donohoe, of Dulzura, owner.

Corporal Mine (Quartz).—See Beyers.

Coyote Mine (Quartz).—It is 7 miles S.W. of Escondido, at 1,100′ elevation. Here is found a series of mineralized shoots having a common N.W. strike, in a light gray diorite. The workings consist of a 60′ tunnel and several surface cuts. H. W. Roff et al., of Escondido, owners.

Cravath Mine (Quartz).—See our VIIIth, XIth, and XIIth Reports, pp. 524, 382, and 239. It is 2 miles S.E. of Escondido, on the old Escondido lead. Idle. Gus Cravath, of Escondido, owner.

Crescent Mine (Quartz).—It is a prospect in Crescent Valley, 3 miles S.W. of Escondido, at 600′ elevation. A 65′ vertical shaft has been sunk. Ranford Worthing, of Escondido, owner.

Deer Park District.—This is situated above Pine Valley, about 10 miles E. of Descanso. There are a number of claims in the district on which superficial work has been done. The quartz veins are well defined on the surface, though of low grade. The formation is granite and gneissoid rocks. There is an arrastra and a 2-stamp mill in the district, both of which are idle.

Deer Park Mine (Quartz).—It is in Deer Park, 10 miles E. of Descanso, at 4,400′ elevation. A small cut was made on an 18″ vein, which strikes N.W. and dips N.E. A 50′ vertical shaft was then sunk in the hanging-wall, but no vein encountered, furnishing another example of the advisability of "staying with the vein," when prospecting. G. Collier Robbins, of San Diego, owner.

Double Standard Mine (Quartz).—See Hawkes.

Dulciana Mine (Quartz).—It is 25 miles N. of Yuma, in Picacho Basin, at 700′ elevation. It has two shafts, 75′ and 80′ deep respectively. It is on one of the gold-bearing zones peculiar to this district, consisting of a mass of crushed rock, probably diorite, now schistose and largely chloritic. Quartz occurs only as disseminated grains (an original constituent of the rock), vein-quartz not appearing in the deposit at all. The walls are only defined by the limit of the pay zone. S. W. Dorsey, of Denver, owner.

Dulzura District.—See our XIth Report, p. 382. It is 30 miles E. and a little S. of San Diego. The ore-deposits occur in felsite along zones of brecciated and crushed rock. The quartz is low-grade for the most part, though sometimes rich streaks are found. The region seems to have been unfortunate in its metallurgical experiments. There is a 5-stamp mill, of unheard-of pattern, and a roller mill on the Oneida Mine; neither of which ever obtained satisfactory results, being placed there by the inventors for the purpose of experiment. An arrastra, run by a gasoline-engine, is now doing good work on one of the claims.

Duncan Mine (Quartz).—It is 15 miles N.E. of Yuma, at Pot Holes. The vein strikes N.W. A 150′ shaft has been sunk on the foot-wall, at 40° inclination. The width of the vein is unknown, as the whole excavation is in quartz and vein material. R. J. Duncan, of Yuma, owner; E. A. Wetmore, of Yuma, superintendent.

Eagle Mine (Quartz).—It is a prospect, ¼ mile S.E. of Julian, at 4,200′ elevation. It has only superficial development. A. P. Frary, of Banner, owner.

Eastern California Mine (Quartz).—It is in Picacho Basin, 25 miles N. of Yuma, and is similar to the Dulciana. It has a 50′ shaft. Further development work is now in progress. S. W. Dorsey, of Denver, owner.

East End Mine (Quartz).—See Noble's.

Elevado Mine (Quartz).—It is 1½ miles S. of Banner, at 3,300′ elevation. This is a new mine, opened within the past two years. The vein strikes N.W., and dips 60° S.W. The shaft is 160′ deep; two levels have been run at depths of 50′ and 100′ respectively, which expose a vein 2′ to 8′ wide. Within this zone are one, two, and sometimes three quartz veins, carrying gold. The quartz is very fine in grain, considerably stained with iron and manganese oxides, and is crushed throughout into small pieces, being found pulverized in many places. There is every indication of movement and pressure in these levels. A fault has displaced the vein on the 100′ level, and prospecting below that point is in progress for the purpose of discovering the downward continuation of the vein. C. F. Hall et al., of San Diego, owners.

Ella Mine (Quartz).—See our VIth (Part I) and XIIth Reports, pp. 85 and 239. It is 1½ miles S.E. of Julian, at 3,600′ elevation. Estate of S. N. Wilcox, of Julian, owner; E. A. Stanley, of Banner, lessee.

Escondido District.—Within the past two years there has been a marked interest in mining in the hills surrounding the valley of Escondido. The most extravagant reports as to the extent and richness of the mines were published. A careful investigation of the region was made, with the following result: Grano-diorite, passing over in some localities on the western border of the region into gray diorite, forms the main rock-mass over a large territory. On the east grano-diorite predominates, and to the northward of Escondido mica-schist is found. Throughout this area of nearly 200 square miles are found intrusive dikes and masses of eruptive rock. These rocks are grayish-green, dark-green, and black diorite, felsite, felstone, felsitic breccias, and pegmatite. The so-called phonotite of the region is a dark-gray felsitic rock and a black diorite-ophanite. These dikes are from 3′ to over 100′ in width, branching and irregular, having the characteristic tendencies of eruptives generally. Certain portions of these dike-masses have been crushed along planes, usually striking in a northerly and southerly direction, and into these crushed zones have infiltrated silica and sulphide minerals. The oxidation of the latter has produced the red, brown, and yellow colors in these rocks, which forms such a prominent feature of the outcrops. In a score of places, cuts, shafts, and tunnels have been made for the purpose of exploring the deposits. To determine the character of the so-called ore from this district, samples were selected from three of the principal claims. The rock was pulverized and a portion carefully panned, to ascertain whether or not it contained free gold. None was obtained. The remainder of the three samples was then submitted to L. Falkenau, formerly State Assayer, with instruction to use the utmost care. Four tests were made of each sample, with the following result:

No. 1.	*Geneva Mine*	Silver, trace; Gold, 0.006 oz., or about 12 cents per ton.
No. 2.	*Moe Mine*	Silver, trace; Gold, trace.
No. 3.	*Granite vein*	Silver, trace; Gold, trace.

Escondido Mine (Quartz).—See our VIIIth, IXth, and XIIth Reports, pp. 524, 382, and 240. It is 2 miles S. of Escondido, and has been idle since our last Report. Escondido Land and Town Co., of Escondido, owner.

Eureka Mine (Quartz).—See Noble Group. It has a 300′ tunnel and an incline 100′ deep.

Fraction Mine (Quartz).—See Cable.

Free Coinage Mine (Quartz).—See Hawkes.

Geneva Mine (Quartz).—It is 3 miles E. of Escondido, at 1,000′ elevation. It is the principal claim of the newly discovered mines of the locality. The geology in the vicinity of the mine is very simple. The formation is grano-diorite, into which has been intruded a dike of felsitic rock about 100′ thick, which strikes N.E., and is found to split into two branches going northward. The rock is very silicious, fine-granular in texture, and has been improperly called quartzite. It is much shattered and crushed and is impregnated throughout with finely divided iron sulphide. The upper portion is stained throughout with iron oxides. The dike dips 30° to 40° S.E. A 75′ vertical shaft was sunk near the western edge of the rock-mass, passing through a portion of the dike and into the foot-wall. A second shaft was sunk in the hanging-wall granite; a third, 30′ deep, was sunk on the vein, and several superficial cuts made. It is claimed by the owners that the rock is all gold-bearing, but that it is not free, the idea being that the gold is in combination with the sulphide minerals. Were this the fact it would be reasonable to expect to find "free gold" in the oxidized zone, but this is not the case.

Most of the claims in this region are almost identical geologically, the exceptions being the formation of "ore-shoots" in crushed zones of diorite. The mines are all similar, in that they do not show gold with the pan or horn. If, as is claimed by the owners, the gold occurs associated with the pyrite only, it resolves itself into a simple concentrating proposition, with the subsequent treatment by chlorination or some other process. Geneva Mining Co., of Santa Ana, owner; H. C. Brown, of Escondido, manager.

Gold Chain Mine (Quartz).—It is in White Gold Basin, 30 miles N. of Yuma, and is a claim of the Swain group. A cut 20′x 30′ has been made on a large mineralized zone. See White Gold Basin. W. Swain, of Picacho, owner.

Gold Cliff Mine (Quartz).—It is at Mesa Grande, near the Shenandoah. It has only superficial development.

Gold Crown Mine (Quartz).—See White Gold Basin.

Gold Hill Mine (Quartz).—See White Gold Basin.

Gold King Mine (Quartz).—See our VIIIth, IXth, Xth, XIth, and XIIth Reports, pp. 513, 143, 543, 381, and 241. It is 4 miles S.W. of Banner, at 400′ elevation. It has a shaft with several levels. Idle. The mill is situated at Banner, 11 miles distant by road. The same mill is used to crush ore from the Cincinnati Belle and Gold Queen, an adjoining mine. Banner Gold Mining Co., of Pomona, Los Angeles County, owner.

Gold King Mine (Quartz).—It is 30 miles N. of Yuma, near White Gold Basin. A 50′ vertical shaft has been sunk on a mineralized zone in diorite. W. Swain, of Picacho, owner.

Gold Prince Mine (Quartz).—It is a prospect 30 miles N. of Yuma. See White Gold Basin. W. Swain, of Picacho, owner.

Gold Princess Mine (Quartz).—It is a prospect 30 miles N. of Yuma. See White Gold Basin. W. Swain, of Picacho, owner.

Gold Queen Mine (Quartz).—It is a prospect 30 miles N. of Yuma. See White Gold Basin. W. Swain, of Picacho, owner.

Gold Queen Mine (Quartz).—It is 4 miles S.W. of Banner, at 4,000′ elevation. A 100′ shaft has been sunk on a vein in granite. See Gold King. Banner Gold Mining Co., of Pomona, Los Angeles County, owner.

Gold Rock Mines (Quartz).—See Golden Cross.

Gold Rule Mine (Quartz).—See Jaeger.

Golden Chariot Mine (Quartz).—It is 4 miles S.E. of Banner. See our VIth (Part I) and IXth Reports, pp. 86 and 147. Pacific Bank, of San Francisco, owner.

Golden Casket Mine (Quartz).—See Picacho.

Golden Crescent Mine (Quartz).—It is 3 miles S.W. of Escondido, near Crescent Valley. The claim is located on a large mass of granulite, much crushed and iron-stained, and the feldspar kaolinized. The workings are superficial. J. B. Carrol et al., of Escondido, owners.

Golden Cross Mines (Quartz).—See our XIIth Report, p. 240. They are in Cargo Muchacho Mountains, at Hedges, 25 miles N.W. of Yuma and 6 miles by road N.E. of Ogilby. Since our last Report these mines, which comprise a large group of claims, have been opened quite extensively. The principal claims are the *Golden Cross*, *Golden Crown*, and *Golden Queen*. The deepest workings are in the last, being 550′ on the 40° incline. The Golden Cross and Golden Crown are 250′ and 350′ deep respectively. The more recent development of these mines has thrown some new light on the peculiar formation. The masses of rock, which are found to be gold-bearing, are chiefly micaceous and hornblende schists, usually very silicious. The ore-shoots are variable in size. That in the Golden Cross is 70′ thick at one place, and in the Golden Crown there is a 20′ stope. The workings of the Golden Queen are more extensive than either of the former, and lie in a different, though parallel, zone. It has been found that the foot-wall side is usually better defined than the hanging-wall, and is more regular. The gold-bearing zones are not clearly defined at all places. They occur as a series of "swells" making up into the hanging-wall side, being usually thickest at the center and thinning out at the sides. It is sometimes, though not always, possible to distinguish pay-rock from that which is barren, by the physical appearance. Among the usual occurrences of gold in these mines may be mentioned the finding of gold in masses of hornblende, without visible free quartz; in an aggregation of biotite scales; in pegmatite (dike rock); and frequently in a highly silicious rock containing much epidote, and often garnets. Since our last Report a new 100-stamp mill has been built some distance above the old 40-stamp mill. The stamps of the new mill weigh 1,000 lbs. each, whereas those of the old mill weigh but 850 lbs. Considerable difficulty has been experienced in recovering the gold from the rock. As the rock contains no sulphurets, it was thought that the gold might have some sort of coating, but when passed through the mill the tailings showed no free gold, although they assayed from $1 to $3 per ton. During the spring of 1896 a series of experiments was made which demonstrated quite fully that finer crushing was required to release the gold from the matrix. This necessitates finer screens than had ever before been employed, but it also was found that a greater percentage of gold was saved, though the capacity per stamp was considerably reduced. The material from the mines consists chiefly of silica; the gold is usually very fine, though coarse particles are also found. Since the probable cause of former loss has been discovered, it would appear that little further difficulty need be expected in that direction. The capacity of the pipe-line from the Colorado River has been increased and about 250,000 gals. of water are now delivered in the reservoir, at a cost of about 10 cents per ton of ore crushed. The tailings are settled and the water pumped back to the mills, so that in a measure it becomes a circulating supply. The several mines were found in good condition, with a large ore reserve in sight. The square-set system of timbering is in use, and has thus far proved satisfactory. The timbers are 8″x 10″ and 10″x 10″. Filling stopes with waste is carried on contemporaneously with extraction of ore. Some disastrous caves resulted in the early history of these mines from neglect to observe the necessary precautions in timbering, and when no filling at all was used. Golden Cross Mining and Milling Co., of Los Angeles, owner; T. S. Fuller, manager; John Gray, of Hedges, superintendent.

Golden Crown Mine (Quartz).—See Golden Cross.

Golden Dream Mine (Quartz).—See White Gold Basin.

Golden Queen Mine (Quartz).—See Golden Cross.

Golden Rule Mine (Quartz).—See Picacho Mines.

Golden Sunshine Mine (Quartz).—See White Gold Basin.

Goshen Mine (Quartz).—It is 25 miles N. of Yuma, in Picacho Basin. There are two shafts on the claim, 170′ and 240′ deep respectively. It is one of the Jayne group. Idle.

Happy Jack Mine (Quartz).—It is 7 miles N.E. of Descanso, at 4,000′ elevation. A small vein is found in the granite, on which considerable work of a superficial character has been done. A cross-cut tunnel is now being run to intercept the vein, the distance being estimated at 110′. The Iron Mask and War Eagle are included in this property. G. Collier Robbins, of San Diego, owner.

Harper's Mine (Quartz).—It is 12 miles E. of Descanso, near Rattlesnake Valley. It is a prospect, having two shafts 50′ deep each. J. D. Harper, of Cuyamaca, owner.

Hawkes' Mines (Quartz).—These two claims, *Free Coinage* and *Double Standard*, are on Indian Creek, at 4,200′ elevation. The property has only superficial development. Eugene Hawkes, of Descanso, owner.

Hedges District.—This is not an organized mining district, but a portion of the Cargo Muchacho region. The gold-bearing deposits occur as impregnations in hornblendic and micaceous schists. No sulphides have as yet been encountered, even in the deepest levels, and, judging from the appearance of the rock near the surface, it is not likely that they will ever be found in any considerable amount. No fissure veins have as yet been found in the vicinity, though in the southern end of the range, near the old Cargo Muchacho Mine, fissures abound. The entire region north of the big cañon (see Cargo Muchacho region) is a network of pegmatite veins which vary greatly in size, and send out branches in every direction. The dikes usually cut the stratified rocks at some angle. The gold-bearing deposits occur at several geological horizons across a territory a mile wide. The general strike of the formation is N.W. and S.E. The dip varies from 15° to 40° S.W., to which the ore-shoots apparently conform, but they do not pitch directly at a right angle to the strike, but trend to the N.W. as depth is attained. See also Cargo Muchacho District and Golden Cross Mines.

Helen May Mine (Quartz).—It is 25 miles N. of Yuma, in Picacho Basin, and is one of the claims of the Picacho group. It has a shaft, and sinking is in progress. S. W. Dorsey, of Denver, owner.

Helvetia Mine (Quartz).—See our IXth, Xth, XIth, and XIIth Reports, pp. 145, 542, 376, and 241. It is 1½ miles S.E. of Julian, at 4,000′ elevation. The mine was closed soon after our last Report was issued. There are two shafts, 200′ and 180′ deep respectively, and an 80′ winze below the deepest level. Cause of stoppage not stated. Pacific Bank, of San Francisco, owner.

Hermit Mine (Quartz).—See Beyers.

Hickory Jim Mine (Quartz).—It is in the Laguna Mountains, 13 miles N. E. of Descanso, at 4,500′ elevation. It has a 100′ shaft and a tunnel 100′ long. J. F. Neeley, of San Diego, owner.

Hidden Treasure Mine (Quartz).—It is ½ mile N. of Banner, at 3,200′ elevation, and is worked through a tunnel 300′ long. There is a labyrinth of underground workings above the tunnel level. Bailey Bros., of Banner, owners; Frank Young et al., of Banner, lessees.

High Peak Mine (Quartz).—See our Xth and XIIth Reports, pp. 542 and 241. It is ¼ mile E. of Julian, at 4,400′ elevation, and has two tunnels, 40′ and 100′ long respectively. Worked in a small way. Horace Wilcox, of Julian, owner.

Hubbard Mine (Quartz).—See North Hubbard.

Hillside Mine (Quartz).—It is in Rice District, 12 miles E. of Banner, at 3,800′ elevation. It has a 150′ tunnel and two small shafts on a 2′ vein in granite. Charles McGeary, of Warner, owner.

Iron Mask Mines (Quartz).—See Happy Jack.

Jaeger Mines (Quartz).—They are 30 miles N. of Yuma, and comprise the *Gold Rule*, *May Queen*, *Minnie*, and *Nugget* claims. The May Queen has a 40′ shaft and a cross-cut on the surface 16′ deep. L. J. F. Jaeger, of Yuma, owner.

Jayne Mines (Quartz).—See our XIIth Report, p. 241. They are in Picacho Basin, 25 miles N. of Yuma, and comprise the *Goshen*, *Mars*, *St. George*, and *Venus* claims. They were in active operation about 1880, when a 15-stamp mill was built on the bank of the Colorado River, 5 miles from the mines. The mill building is on stone—rhyolite tuff—quarried on the mill-site. A large quantity of rock was crushed, which it is claimed paid, but for some reason operations were suspended and never resumed. Dr. DeWitt C. Jayne, of Florida, N. Y., owner.

Jita Mine (Quartz).—See White Gold Basin.

Johnston Mines (Quartz).—See our XIIth Report, p. 241. These are in Dulzura District, 30 miles E. of San Diego, at 1,600′ elevation. They are the *Johnston* and *Oneida* mines. On the Johnston a shaft has been sunk 80′ on a zone of rock containing vein-like masses of fine-grained quartz, in which appears considerable arsenical pyrite. This ore, it is claimed, is rich in gold. A long tunnel was driven across the formation to intersect this vein, but to all appearances has not reached it, and is now caved. A second tunnel, with cross-cuts, has been driven several hundred feet, and a winze sunk on a mass of mineralized felsitic rock, which contains a small amount of gold. On the Oneida are several surface cuts, a 20′ shaft with a 30′ drift, a 5-stamp and a roller mill. The rock is low grade and the milling machinery inefficient. With the necessary capital and proper machinery, these mines might possibly make a better record. Charles Johnston, of San Diego, owner.

Jolly Boy Mine (Quartz).—It is 3½ miles S.W. of Escondido, near Crescent Valley, at 750′ elevation. In the spring of 1896 a tunnel was driven 100′ into a mass of decayed grano-diorite, and a small shaft sunk at another point in the same material. When it was ascertained that the rock contained no gold the work was suspended. Q. R. Smith, of Santa Ana, owner.

Julian District.—See our VIth (Part I), VIIIth, IXth, Xth, XIth, and XIIth Reports, pp. 82, 512, 144, 540, 376, and 241. The district includes the Julian and Banner region, and is 65 miles N.E. of San Diego. There are a score of mines operating in a small way, partly by owners and partly by lessees. Among these are several new mines. Most of the quartz mined is crushed in custom mills. There are no deep workings in the district. It would seem, however, that the gold-bearing lenses would be found to continue in depth. As the zones are continuous in a common direction along the surface, it does not appear that the topography of the county bears any relation to the depth to which these lenses may be found to extend. The mines at and near Julian are 4,000′ to 4,300′ elevation.

Kentuck S. Mine (Quartz).—See our Xth, XIth, and XIIth Reports, pp. 542, 380, and 241. It is ½ mile N.W. of Banner, at 3,400′ elevation. A new tunnel has been driven 70′ on a 6′ vein. The old workings consist of a 97′ shaft, with stopes to the surface, now caved. Also a three-compartment shaft, 100′ deep, substantially timbered, and intersected at the 50′ level by an adit tunnel. L. N. Bailey, of San Diego, owner.

La Condado Mine (Quartz).—It is a new claim on La Condado ranch, 6 miles N.E. of Escondido, at 1,500′ elevation. D. W. McKay, of Escondido, owner.

Little Granite Mine (Quartz).—It is in Rice District, 12 miles E. of Banner, at 3,800′ elevation. It is a prospect, with merely superficial workings. Rice Bros., of Warner, owners.

Lucky Ben Mine (Quartz).—It is near Banner, at 3,200′ elevation. Boswell & Walker, of Banner, owners.

Madden Mine (Quartz).—See our VIth (Part I) and XIIth Reports, pp. 86 and 242. Charles Bacon, of Banner, owner.

Mars Mine (Quartz).—It is in Picacho Basin, 25 miles N. of Yuma, at 700′ elevation. It has two shafts, each about 240′ in depth; one sunk on the vein and the other in the country rock. It is said drifts have been run from the shaft, in ore, 38′ W. and 78′ E. These workings are now caved. (See Jayne Mines.) Dr. DeWitt C. Jayne, of Florida, N. Y., owner.

Matamora Mine (Quartz).—See Jaeger.

Mesa Grande District.—See our XIth Report, p. 382. It is 65 miles N.E. of San Diego. The northwestward extension of the Julian mineral belt passes through the district. The formation is chiefly mica-schist, with numerous dikes of coarse-grained granite, in which black, green, and red tourmaline occur. The mines are mostly idle at present. Some new prospects were recently found, but at this writing only superficial work has been done.

Mina Rica Mine (Quartz).—See Picacho.

Minnie Mine (Quartz).—See Jaeger.

Moe Mines (Quartz).—They comprise three claims situated 2½ miles N.E. of Escondido, at 900′ elevation. A tunnel has been run 30′ on a dike of silicious felstone, much mineralized. Superficial cuts have been made on the other two claims. (See Escondido District.) E. A. Moe, of Escondido, owner.

Monarch Mine (Quartz).—It is a prospect 4 miles N.E. of Escondido, at 1,600′ elevation. A. H. Beach, of Escondido, owner.

Morgan Mines (Quartz).—These new prospects, discovered in May, 1896, are 3 miles N.E. of Mesa Grande. They have only superficial workings as yet. A. C. Morgan et al., of Mesa Grande, owners.

Morning Star Mine (Quartz).—It is in Rice District, 12 miles E. of Banner, at 3,500′ elevation. The vein, 12″ to 24″ wide, is a fissure in gneissoid rocks. A 70′ shaft has been sunk on the vein. At 50′ a fault was encountered, and the bottom of the shaft is in the country rock. Haight & White, of Riverside, owners.

Mother Lode Mine (Quartz).—See our XIIth Report, p. 242. It is in the Cargo Muchacho Mountains, 1 mile N. of the Cargo Muchacho Mine. The vein is 12″ to 4′ wide, and is developed by several tunnels, shafts, and cuts. A Huntington mill is used to crush the quartz, when the mine is working. Dr. Mathison, of Ogilby, owner.

Mountain Lion Mine (Quartz).—It is 6 miles S.W. of Escondido, at 600′ elevation. A vertical shaft has been sunk 65′ on a mass of mineralized felsite. H. C. Brown et al., of Escondido, owners.

Nana Mine (Quartz).—See Banner.

National City Reduction Works.—They are at National City, and consist of a 10-stamp mill, pans, settlers, etc. Crushing rolls, rotary screens, jigs, and 2″ "round-table" concentrators have been recently added.

The "round tables" are 16′ in diameter, and covered with Portland cement. The additions to the mill have been made for the purpose of concentrating the tailings lying about the mill, several thousand tons of which are from the Cedros Island Mine, Lower California. B. F. Masten, of Redlands, lessee.

Neptune Mine (Quartz).—It is a prospect near Banner. W. W. Boswell, of Banner, owner.

N. G. (*Yellowhammer*) *Mine* (Quartz).—It is in Rice District, 12 miles E. of Banner, at 3,675′ elevation. The vein is solid massive quartz, 2′ to 8′ thick, standing nearly vertically, and striking N. 80° W. The strike of the formation is nearly N. and S. Along one side of the vein is found a series of cavities lined with rudely-formed quartz crystals, with gold. An 80′ shaft has been sunk, and a 25′ drift run E. at 30′ from the surface. There are also several cuts. J. B. Rice et al., of Warner, owners.

Noble's Mines (Quartz).—See our IXth, Xth, XIth, and XIIth Reports, pp. 141, 544, 382, and 238. They are the *Bay View*, *Bobtail*, *East End*, *Eureka*, *Oxide*, *Spring*, and *Treasure*, and are about 10 miles E. of Descanso, at 4,500′ to 5,000′ elevation. These veins resemble those between Julian and Banner, being lenses of granular quartz in mica-schist. The various claims all have more or less development, consisting of many superficial cuts, tunnels 50′ to 300′ in length, winzes and shafts 20′ to over 100′ in depth. The quartz mined is hand-sorted, and "packed" on burros to the mill, 1½ miles distant by good road. The 1-stamp mill is run intermittently. Thomas Noble & Sons, of Descanso, owners.

North Hubbard (*Hubbard*) *Mine* (Quartz).—See our VIth (Part I), XIth, and XIIth Reports, pp. 87, 380, and 241. It is ¼ mile S.W. of Banner, at 3,100′ elevation. A cross-cut tunnel has been run 260′ to, and a winze is now being sunk on, the vein. There are also some superficial workings. The property is equipped with a 5-stamp steam-power mill. Hazzard & McDowell, of San Diego, owners.

North Star Mine (Quartz).—It is a new claim, 1½ miles S.E. of Banner, at 3,200′ elevation. There are two veins, on one of which is a 45′ shaft, with 40′ and 28′ drifts along the vein. On the second vein there is a 115′ shaft, sunk with a horse-whim. J. C. Coffman et al., of Banner, owners.

Nugget Mine (Quartz).—See Jaeger.

Oneida Mine (Quartz).—See Johnston.

Oriental Mine (Quartz).—See White Gold Basin.

Oriflamme Mine (Quartz).—See our VIth Report (Part I), p. 89. It is 10 miles S.E. of Banner, in a rugged region on the border of the Colorado Desert. Idle for years. San Diego Development Co., of Boston, Mass., owner.

Oro Blanco Mines (Quartz).—They are in White Gold Basin, 30 miles N. of Yuma, and comprise the *Castillo*, *Estrella*, and *Oro Blanco*. They are located on a large zone of crushed and mineralized rock, which appears to have been felsite. The zone is continuous for several thousand feet, and lies partly in a cañon, the soft nature of the rock causing it to disintegrate more rapidly than the surrounding unaltered country rock. The gold found in these deposits is alloyed with silver to such an extent as to give it a white color. It is owing to this fact that the region in which the vein occurs has been called White Gold Basin. This alloy is worth from $12 to $13 per oz. The mineralized zone is more than

100′ wide, and all the tributary gulches have been "placered" by Mexicans, with dry-washing machines. W. Swain, of Picacho, owner.

Oro Fino Mine (Quartz).—See our XIIth Report, p. 242. It is a prospect 2 miles S.E. of Escondido. F. H. Roberts, of Escondido, owner.

Overlook Mine (Quartz).—See Banner.

Owens Mine (Quartz).—See our VIth (Part I), VIIIth, IXth, Xth, and XIIth Reports, pp. 85–87, 519, 144, 541, and 242. It is at Julian, at 4,300′ elevation. Since our last Report operations have been resumed at this mine. The shaft is 350′ deep, vertically. A drift is being driven on the lowest level of the mine, in which some good gold-bearing quartz is found. The 10-stamp mill is being put in good condition, and this quite famous mine will probably soon become again a bullion-producer. Owens Cons. Mining Co., owner; H. A. Williams, of Julian, superintendent.

Oxide Mine (Quartz).—See Noble's.

Oxide Mine (Quartz).—It is a prospect near Crescent Valley, 3 miles S.W. of Escondido. (See Escondido District.) D. Crise, of Escondido, owner.

Padre y Madre Mines (Quartz).—They are in the Cargo Muchacho Mountains. Idle for years. Lloyd Tevis, of San Francisco, owner.

Pasadena Mine (Quartz).—See our XIth Report, p. 386. It is in the Cargo Muchacho Mountains, at 800′ elevation. The mine has not been actively operated for several years, though a man is kept employed in prospecting work most of the time. Thomas Grimes et al., of Pasadena, owners.

Paymaster Mining Co.—See Cargo Muchacho.

Picacho Basin.—It is 25 miles N. of Yuma, and about 5 miles from the Colorado River. The basin consists of low, rolling hills, covered in part by washed gravel and detritus from the neighboring hills. These superficial deposits are gold-bearing, and have been worked by Mexicans and Indians for years, the gold being formerly separated by tossing the lighter material in blankets in the wind, and recently by dry-washing machines. Some years since the entire tract was consolidated under the title "California Picacho Company," and a pumping plant erected on the bank of the river. It was a failure. The rock formations underlying the superficial deposits are micaceous and hornblende schists, diorite, and a few intrusive dikes, mostly granitic. On the east, south, and west, steep, rugged hills of rhyolite, rhyolite tuff, and andesitic rocks occur; the most prominent mass being the rugged ridge called Picacho (peak), which is only a remnant of the vast field of eruptive rock which once covered the country for many miles. The Picacho rises 1,500′ above the Colorado River, and was probably at one time much higher than now. A great number of claims have been located, and considerable work done. The absence of gold-bearing quartz veins in the district is a noticeable and unusual feature.

Picacho Mines (Quartz).—They are in Picacho Basin, 25 miles N. of Yuma, and comprise the *Apache*, *Dulciana*, *Eastern California*, *Golden Casket*, *Golden Rule*, *Mars Extension*, *Mina Rica*, and *Tierra Rica*. They adjoin and surround the claims of the Jayne group. The claims are being developed, with encouraging prospects. S. W. Dorsey, of Denver, owner; F. Guerra, of Picacho, superintendent.

Pine Ridge Mine (Quartz).—It is a prospect in Rice District, 12 miles E. of Banner, at 3,700′ elevation. C. Helm, of Warner, owner.

Pine Valley District.—See our IXth, Xth, XIth, and XIIth Reports, pp. 141, 544, 382, and 242. The mines of the district are found in granite and mica-schist. The region properly includes the mines of Deer Park and Rattlesnake Valley. The quartz in the schist is of the rather vitreous, granular sort, similar to that found near Banner and Julian, and, as at those places, occurs in a series of lenses. The veins are in the granite, and some of the quartz is rich. Generally speaking, the rock of this district contains more than $5 per ton, though some of it is worthless.

Ponce de Leon Mine (Quartz).—See White Gold Basin.

Pot Holes (Placer).—See our XIIth Report, p. 242. These mines are worked in a very desultory way by a few Mexicans.

Ranchita Mine (Quartz).—It is 1½ miles S.E. of Banner, at 3,300′ elevation. The mine was discovered since our last Report, and is an unusual one in some respects. The formation is mica-schist, striking N.W. and dipping 70° N.E. In this schist, which is probably a metamorphosed, sheared granite, is found a series of nearly parallel, somewhat irregular, quartz lenses, which cut the strike of the schistose rock at an angle of about 20°. These lenses appear to terminate upon reaching what seems to be a fault-plane striking nearly E. and W. The quartz bodies are 12″ to 3′ thick, and are found 4′ to 5′ apart for some distance along the fissure above referred to. A somewhat similar occurrence was noted at the Starlight-Riverside Mine in Madera County. A 145′ inclined shaft has been sunk, several levels opened, and considerable stoping done. The rock is crushed in a custom mill at Banner. C. J. Couts, of San Diego, owner; John C. Coffman, of Banner, superintendent.

Ready Relief Mine (Quartz).—See our VIth (Part I), VIIIth, IXth, Xth, and XIth Reports, pp. 87, 513, 147, 543, and 378. It is at Banner, at 2,900′ elevation. It is worked through three adits, and has a good 10-stamp water-power mill. A 12′ Pelton wheel, under 600′ pressure, is used. This wheel was constructed by bolting Pelton buckets on the periphery of the flywheel of an engine, the cylinder of which has been converted into an air-compressor. Idle. Bailey Bros., of Banner, owners.

Redman Mine (Quartz).—See our VIth (Part I) and XIth Reports, pp. 87 and 380. It is at Banner, at 2,800′ elevation, and is the north extension of the Ready Relief Mine. The principal developments consist of a vertical shaft, 113′ deep, and a tunnel on the vein 120′ long, which intersects the shaft 25′ from the surface. Nine inches of water, under a 650′ head, is used in an "ejector" to raise the three inches from the mine. Bailey Bros., of Banner, owners.

Rica Tierra Mine (Quartz).—See Picacho.

Rice District.—It is about 12 miles E. of Banner and southerly from Warner, on the western border of the Colorado Desert. The formation is metamorphic, consisting of mica-schist, gneissoid rocks, quartzite, and limestone, and lies near a large granite area. The veins are well-defined fissures, cutting the rocks both in strike and dip. Several veins were found to be faulted in some places, with considerable displacement, and in others by side thrust, to overlap. The claims thus far located are in the prospective stage. There are no mills or mining machinery in the district.

Ruby Mine (Quartz).—See our XIth Report, p. 380. It is at Banner. A 5-stamp mill belongs to the property. Idle.

San Diego Mine (Quartz).—It is near the Helvetia Mine, 1 mile S.E. of Julian, at 4,000′ elevation. A new 125′ inclined shaft has recently been sunk, at an angle of 70°. It has a steam hoist, but no mill. W. R. Malone, of Salt Lake, Utah, owner; H. A. Williams, of Julian, agent.

San Felipe Mine (Quartz).—It is ½ mile E. of Banner, at 2,800′ elevation. The vein strikes N. and S., and dips nearly vertically. The walls are granite. A shaft is sunk 30′ on a vein, 12″ to 18″ wide. The rock will be hauled to the Ready Relief mill at Banner. Bailey Bros., of Banner, owners.

St. George Mine (Quartz).—See Jayne.

Shenandoah Mine (Quartz).—See our XIth and XIIth Reports, pp. 382 and 242. It is 1½ miles N.E. of the Indian rancheria at Mesa Grande, at 3,200′ elevation. It has a 175′ shaft, equipped with a steam hoist, and a 5-stamp mill. S. A. McClure, of San Diego, owner.

South Hubbard Mine (Quartz).—See our VIth (Part I) and XIth Reports, pp. 87 and 380. It is ½ mile W. of Banner, at 3,000′ elevation. The vein strikes N.W. and dips 45° N.E. A 300′ cross-cut tunnel strikes the vein 200′ below the surface. Drifts have been run 90′ S.W. and 400′ N.W. An open shaft connects this adit level with the surface. Bailey Bros., of Banner, owners.

South Ruby Mine (Quartz).—It is a prospect, near Banner. N. Barry, of Riverside, owner.

Spike Mine (Quartz).—See Beyers.

Spring Mine (Quartz).—See Noble's.

Stonewall Mine (Quartz).—See our VIth (Part I), VIIIth, IXth, Xth, XIth, and XIIth Reports, pp. 89, 515, 143, 540, 382, and 243. It is on the Cuyamaca Grant, 10 miles S. of Julian. Idle for three years past. Sather Banking Co., of San Francisco, owner.

Sundown Mine (Quartz).—It is a prospect in Rice District, 12 miles E. of Banner; has a 10′ shaft. Mrs. C. Helm, of Warner, owner.

Tierra Rica (Quartz).—See Picacho.

Treasure Mine (Quartz).—See Cable.

Treasury Mine (Quartz).—See Noble's.

Valentine Mine (Quartz).—It is a prospect, 2 miles S. of Julian, at 3,700′ elevation. E. A. Stanley, of Banner, owner.

Valley View Mine (Quartz).—It is a prospect, in the Rice District, 12 miles E. of Banner, at 4,000′ elevation. Rice Bros., of Warner, owners.

Venus Mine (Quartz).—See Jayne.

War Eagle Mine (Quartz).—See Happy Jack.

Warlock Mine (Quartz).—See our Xth and XIIth Reports, pp. 544 and 243. It is 1 mile N.W. of Banner, at 3,300′ elevation. W. H. Bradley et al., of Los Angeles, owners.

Washington Mine (Quartz).—See our XIIth Report, p. 243. It is at Julian, at 4,200′ elevation. It has a shaft 125′ deep. Idle. S. A. McDowell, of San Diego, owner.

Wilcox Mine (Quartz).—See our XIIth Report, p. 243. It is at Banner, at 3,100′ elevation. Idle. L. A. Lee Electric Supply Co., of San Francisco, owner.

Wildcat Mine (Quartz).—It is at Mesa Grande; prospect only.

White Oak Mine (Quartz).—It is 4 miles N. of Escondido, at 1,000′ elevation. A prospect, having a 25′ shaft. J. N. Turrentine et al., of Escondido, owners.

White Gold Basin.—It is 30 miles N. of Yuma and 4 miles E. of Picacho. The hills of the basin are rugged, but not high. It is almost completely surrounded by higher peaks and ridges of rhyolite and rhyolite tuff. The rocks of the basin are diorite, phthanite, mica-schist, hornblende-schist, granulite dikes, and felsitic eruptives. In this region are five parallel zones of fracture. The zones are from 20′ to over 100′ wide, and show signs of great crushing and extensive mineralization. These great fissures are connected by other fractured zones crossing from one to another at varying angles. These are also mineralized, and all are gold-bearing, though mostly low-grade. A very large number of claims have been located, but as yet only a little work has been done. The region is one of possibilities, being near the Colorado River, and at an average of 300′ above it. See White Gold Basin Mines.

White Gold Basin Mines (Quartz).—They are in White Gold Basin, 30 miles N. of Fort Yuma, and comprise a large group of claims, viz.: *Albert Polhamus*, *Alcyon*, *Alfonso*, *Gold Crown*, *Golden Dream*, *Gold Hill*, *Golden Sunshine*, *Jita*, *Oriental*, and *Ponce de Leon*. They have superficial development. D. K. Allen, of Picacho, owner.

Yellowhammer Mine (Quartz).—See N. G.

MILLS IN SAN DIEGO COUNTY.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of Each, in Lbs.	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
					No.	Character.	No.	Capacity.		
Beyers*	Water	2	950							
Blossom		10	850							
Cargo Muchacho		20	850							
Eureka	Steam	2	850							
	Steam	5	850							
Golden Cross		40	850	90						
Gold King and Gold Queen		10	850							
Golden Queen	Steam	100	1,000	225						
Helvetia		10	850							
Mars		15	750							
National City Reduction Works	Steam	10	850		2	Rd. Tables				
North Hubbard		5	800							
Oneida		5	400							
Owens		10	850							
Ready Relief	Steam	10	850		3	Hendy				
Shenandoah		5	850							
Stonewall	Steam	60	850							

In addition to stamps, the mills marked with a * have additional crushing capacity, as noted in the following list:

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN SAN DIEGO COUNTY.

Name of Mill or Mine.	Power.	Number	Character.	Diameter	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
						No.	Character.	No.	Capacity.		
Artery Consolidated	Gas		Arrastra								
Beyers		1	Arrastra								
Clark			Arrastra								
Mother Lode			Huntington								
Oneida		1	Roller								

San Luis Obispo County.

This county consists of mountain, foothill, and valley lands suitable for grazing, agricultural, and horticultural purposes. The stock-raising and dairy industries are important sources of revenue. The principal mineral industry at present is that of bituminous rock, which also promises well for the future. The quarry of "California onyx" is worked intermittently, and gold is said to have been mined profitably from placers in the La Panza District, in the eastern part of the county. The mineral springs are widely known for their medicinal qualities and are, in part, well-improved and much-frequented resorts. Clays suitable for bricks exist within the county and are developed to the extent required by the local demands. There is also a variety of other mineral resources, some of which have been developed to a limited extent, but are now generally idle; *e. g.*, antimony, chromic iron, quicksilver, gypsum, diatomaceous earth, limestone, etc. Some irrigation is carried on, principally along the Arroyo Grande, by diverting water from that stream through small farm ditches on the fertile valley lands.

King David Mine (Quartz).—It is in the La Panza Mining District, about 45 miles E. of San Luis Obispo. The development consists of a 6′x 8′ shaft, 60′ deep, for prospecting a 4½′ vein of quartz, inclosed in a granitic formation. Four men are employed. King David Mining Co., owner; John Mason, of La Panza, superintendent.

Placer Mines.—See our VIIIth, Xth, and XIIth Reports, pp. 530, 578, and 243. Gold occurs in streams and numerous ravines in the La Panza District. Three thousand dollars was produced in 1895, principally in Navajo and De la Guerra creeks and tributaries. On account of the limited water-supply, the mines are worked only in the rainy season.

Santa Barbara County.

Abernathy Mine (Beach).—It is on the beach, 3 miles N. of Point Sal. The gold occurs in black sand, and is saved by washing over canton flannel. Four men are employed. N. Marsh and S. N. Nash, of Guadaloupe, owners.

Anna Moore Mine (Quartz).—It is on San Lucas Creek, 30 miles N.W. of Santa Barbara. The development consists of a 150′ tunnel. Four men are employed in development. Hiram Pierce, of Santa Barbara, owner; W. J. Reseigh, of Santa Ynez, superintendent.

Santa Cruz County.

The economic mineral resources of this county consist principally of bituminous rock and limestone, which promise to continue as important sources of revenue. A limited quantity of gold is disseminated through the beach sands and also in a belt traversing the county N. W. and S.E., in the vicinity of the granite rocks, but its exploitation has not been remunerative. The clay suitable for pottery, etc., exists, but is undeveloped; that suitable for brick is abundant and developed to the extent demanded by the local market. A number of artesian wells exist in the valley lands about Watsonville. The county lying, as it does, on the southwestern slope of the Santa Cruz Mountains, its streams, flowing seaward, have considerable fall, and the more important ones afford water-power, which is only partially utilized.

Shasta County.

Alice Mine (Quartz).—See our XIIth Report, p. 245. It is 6 miles W. from Ono, at about 2,100′ elevation. J. J. Murray, of Ono, owner.

Alice Mine (Quartz).—See our XIIth Report, p. 245. It is 2½ miles N. of Shasta. D. B. Hunt et al., of Stella, owners.

Alliance Mine (Quartz).—It is 5 miles W. of Redding, at 730′ elevation. The N. and S. vein, between granite walls, is filled partially with decomposed granite, and upon which is a 45′ tunnel. One man is at work. Mrs. Lathrop, of Redding, owner.

Alphabetical Mine (Drift).—See Dog Creek Ancient Channel Drift Gravel.

Alvina Mine (Quartz).—It is 4 miles N. of Horsetown, at 1,200′ elevation, and comprises four full claims near Sawmill Gulch. They are designated as the *Alvina*, *Bluejay*, *Gray Fox*, and *Mountain Quail.* The first two veins are about 3′ wide, trend N. and S., crossing Clear Creek, and dipping E. on the contact of granite and diorite. The croppings for 200′, yielding coarse gold, have been placered with 10 inches of water from Sawmill Gulch, through a ditch 1 mile in length and 1′ wide on the bottom. A tunnel has been started on the vein where it crosses the creek, and will give 700′ of backs. There is an 18′ shaft and two smaller ones on the Bluejay, besides several open cuts. The Mountain Quail and Gray Fox are parallel claims on E. and W. veins running to the Alvina. Cheap water-power and timber are available for any purpose. Two men are at work. E. P. Conners, of Redding, owner.

American Mine (Quartz).—See our XIIth Report, p. 245. It is situated on Kline's Gulch, 3½ miles N.W. from French Gulch. J. Conant, of Redding, owner.

Anavina Mine (Quartz).—See our XIIth Report, p. 245. It is 8 miles from Redding and 3 miles from Muletown, and consists of three claims, at 1,300′ elevation. Since our last Report only assessment work has been done. H. Christian and Mrs. Doeblein, of Igo, owners.

Annie Mine (Quartz).—It is 2 miles W. from Shasta, at 1,050′ elevation, and comprises two claims, designated as the *Annie* and the *Shasta.* The former is 3′ wide, trends E. and W., and dips 45° N., between a slate hanging-wall and a porphyry foot-wall. It is being exploited. The croppings on the Shasta vein are 30′ to 40′ wide, and the rock is quite low grade. P. P. Willetta, of Shasta, owner.

Australian Mine (Quartz).—See New Year and Australian.

Balakalala Mine (Quartz).—See *Balaklava*, in our XIIth Report, p. 245. It is 7 miles N.W. from Copley, at 2,330′ elevation, and contains eleven claims on a mineral belt carrying gold, silver, copper, and iron, with a pronounced gossan outcrop trending N.E. The ore-body varies, swelling in places to over 100′ in width, with a probable average of 50′. The ore presents large masses of solid copper and iron sulphides, with occasional copper silver glance, black oxides of silver and copper, and native copper. The developments consist of four tunnels, 800′, 200′, 80′, and 70′ long, respectively, along the outcrop, and a few shallow shafts, the deepest being 90′. The facilities for tunneling into the ore-body from Squaw Creek Cañon are very good. A water-right of 400 inches on the North and South Forks of Squaw Creek may be utilized, with 2½ miles of flume, and water delivered under 650′ pressure. Six men are employed. — Murray et al., of Shasta, owners.

Backbone Mine (Quartz).—It is 4 miles S.W. from Kennett, at 2,100′ elevation, and contains four claims on a N.W. and S.E. vein, supposedly the same gossan outcrop as the Iron Mountain Mine. The developments consist of several shafts and tunnels; the deepest shaft is 60′, and there is a cross-cut tunnel 200′ long, which has not reached the ore-body. Two men are at work. D. McCarthy, — Saeltzer, et al., of Redding, owners.

Bay State Mine (Quartz).—See Indiana.

Big Four Mine (Quartz).—It is 4 miles S.W. of Shasta, at 750′ elevation. The 5′ vein trends N.W. and S.E., and dips 60° N.W., between slate walls, carrying high-grade sulphurets. The developments consist of 150′ of open cut and a 60′ incline. Four men are at work. Water is obtained from Clear Creek.

Billy McCormick (*Jackson*) *Mine* (Quartz).—It is on the Mule Spring Divide, 13 miles N.W. from Ono, at 4,700′ elevation. The 4′ 8″ vein courses N.W. and S.E., between slate and porphyry walls. There is a 35′ tunnel on the vein. Two men are at work. Wm. McCormick, of Ono, owner.

Black and Brown Bear Mine (Quartz).—It is 6½ miles W. of Kennett, at 1,500′ elevation, and comprises eleven claims on a N.E. and S.W. vein in porphyry, extending in places to 20′ in width. There is a 1,000′ tunnel on the vein and a 10-stamp mill, provided with both steam and water power. Water is brought from the South Fork of Squaw Creek through a pipe-line giving 150′ head. The mill has two Triumph concentrators and a 10-section canvas plant. Idle. G. Bliss, of New York, owner.

Black Bear Mine (Quartz).—See Harrison Gulch Mines. D. Lily, of Palo Cedro, and Hunter & Fitzpatrick, of Redding, owners.

Black Prince Mine (Quartz).—It is 2 miles N.W. from Igo, at 1,400′ elevation. The vein trends N.E., dips 45° E. between granite and slate, and varies from simple vein-filling with a few distinct quartz seams to 37′ of solid quartz carrying base silver ores and free gold. A 110′ shaft is sunk and drifts extended 115′ E. and 75′ W. The hoisting is done with a horse-whim and the water removed by bailing. A 40′ adit has been started. Assessment work only. S. W. Robinson, of Igo, owner.

Blackfoot Mine (Quartz).—See our XIIth Report, p. 245. It is 4 miles S. of Shasta. W. A. Boswell, of Shasta, owner.

Black Spider Mine (Quartz).—See our XIIth Report, p. 246. It is near Shasta. J. Bell and J. Scranton, of Shasta, owners.

Bluejay Mine (Quartz).—See Alvina.

Bonanza Mine (Quartz).—See Salt Creek.

Bowery Belle Mine (Quartz).—It is situated 2½ miles N.E. from Shasta, at about 800′ elevation, and comprises five claims, designated the *Bowery Belle*, *Extension*, *Industry*, *Minnehaha*, and *Yankee Blade*. The first, fourth, and fifth are on an 8′ vein, which courses E. and W., and dips 70° N., in porphyritic granite. The Industry and Extension claims are on side veins, 8′ wide, 80′ apart, and about 600′ S. of and trending toward the main vein. The main vein carries ribbon quartz, partly crushed, near the walls, and a glassy, massive quartz in the center. The mine is opened through tunnels; the upper is a 75′ cross-cut, with a 102′ drift on the vein, and showing an 11′ vein in the breast. Another tunnel, 100′ below, runs 400′ on the foot-wall side. Beyond these are a number of shallow inclines from 12′ to 20′ deep. Two men are at work. — Kahn and J. C. Burgbacher, of Redding, owners.

Brunswick Mine (Quartz).—It is 5 miles W. of French Gulch, at 4,000′ elevation, and contains five claims on a N. and S. vein in porphyry, which dips 60° W. and varies in width from a few inches to several feet. The quartz carries but few sulphurets. Developments consist of two tunnels on the vein at comparatively shallow depth, and a 280′ cross-cut at the deepest point of the claim, which will have to be extended 400′ to reach the vein. Ten men are at work. — Rossi and H. Cockran, of French Gulch, owners.

Bullard & Vandever Mine (Quartz).—See our XIIth Report, p. 259. It is 12 miles N.W. of Redding, at 975′ elevation, and comprises two claims, designated the *Santa Rosa* and *Scottish Chief*. The vein is 5′ wide, trends N. and S., and dips 60° S., between syenite and diorite. The most developments are in the former. These consist of a 450′ cross-cut to the vein and a 150′ drift thereon. There is another tunnel 85′ below, which is 200′ long, and is connected with the other by an upraise. A third tunnel is driven 200′ along the vein. All the stoping has been done between the upper levels and the surface. On the Santa Rosa are two tunnels, each 200′ long. With steam-power a 3½′ Huntington mill runs at 70 revolutions per minute, reduces 4 tons per day, saving 80% of the amalgam inside. A canvas plant of seven sections, 22′ long, yields 2 tons of rich slimes per month. Three miner's inches of water are taken from a ditch out of Spring Creek belonging to A. B. Paul, of San Francisco. This ditch is 2½ miles long, 2′ wide on top, 18″ on bottom, 1′ deep, with ½″ grade per rod. Seven men are employed. Bullard & Vandever, of Shasta, owners.

California and Oregon Mine (Quartz).—It is in Flat Creek District, 3 miles S.W. from Kennett, at 750′ elevation, and comprises two claims on two parallel veins which trend N.W. and S.E., and dip vertically, between porphyritic walls. The California vein is 3′ and the Oregon 5′ wide. Both carry a good grade of copper sulphides. There is a 40′ shaft on the California, besides several surface cuts. A shaft has been started on the Oregon. Two men are employed. A. J. Burnett and J. S. Smithson, of Kennett, owners.

Central Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 565 and 246. It is 7 miles N.W. of Redding, at 1,150′ elevation, and comprises 60 acres. The vein varies from a seam to 14′ in width, trends N. and S., and dips 60° W., between slate walls. There are two tunnels at different levels, the upper one being 500′ and the lower 1,300′ long, with an 83′ winze below the upper level; some stoping has been done above the upper level. Two men are employed. W. F. Whitehouse and G. Bliss, of New York, owners.

Clipper and Snider Mine (Quartz).—See our XIIth Report, p. 246. It is at the head of Squaw Creek, 7½ miles W. of Kennett, at 2,300′ elevation. The vein, 1′ to 8′ wide, trends E. and W., and dips 45° N., between porphyry walls. The Snider is not being worked. On the Clipper the 4½′x 9′ incline is 200′ deep, with 30′ sump. A 250′ adit cuts the shaft at 50′. At the 100′ and 200′ stations are drifts 100′ and 200′ long respectively. Two pay-shoots have been developed and extensively stoped. The hoisting is done with a single drum operated by a 16 H.P. engine. The water is removed by a 50-gal. barrel, requiring half a day's hoisting per week. The ore is very heavily sulphuretted, up to 15% in places. The 10-stamp steam-power mill is idle. It has two Frue concentrators and a 30′x 20′ canvas plant, set on 1½″ grade per foot. Fourteen men are employed. J. Barron, of Kennett, and T. Lenasse, of Alameda, owners.

Colorado (*Remonia, D. & B.*) *Mine* (Quartz).—See our XIIth Report, p. 246. It is 2 miles S.W. from Shasta, at about 1,100′ elevation. E. P. Connor, of Shasta, owner.

Consolidated Kosciusko (*Original Quartz Hill*) *Mine* (Quartz).—See our XIIth Report, p. 254. It is 4½ miles S.W. of Redding, at 975′ approximate elevation, and contains three full claims. Since our last Report the quarrying of the large quartz outcrop has been discontinued, and exploitations, by shafts and tunnels 125′ below the outcrop, have been started, proving that in depth a better grade of ore prevails in part, carrying on the pay-shoot, besides the gold and iron sulphurets, native and chloride silver and native copper. Ten electric slime-tables have been added below the canvas plant; also a dynamo of 110-voltage. Each of the 10 electric slime-tables requires a 25 arc-light force. These tables are 6′x 10′, and set on a ¾″ to 1′ grade. The pulp from the canvas plant is sized by a "spitzkasten"-pointed box; the coarse material is allowed to go to waste, and the slimes passed to the head sluice, which distributes them to the table through a number of openings regulated by zinc gates, connected by wire with the positive pole of the dynamo. Four feet from the head of the table are a series of magnets running across it, fitted in level, 3″ wide, and connected by wire with the opposite pole of the dynamo. The sulphide slimes, in passing over the tables, collect on the magnets, from which they are washed every three quarters of an hour, and collected in slime-boxes. About two tons are thus obtained per month, assaying $225 per ton. The dynamo used also furnishes 17 lights in the mill and around the buildings. Forty-five cars of ore, in trains of four cars, drawn by horses, are delivered to the mill per day over the 3½ miles of tramway. The water-power for the mill is obtained from the Calumet Co.'s ditch, which diverts the water from Spring Creek and brings it through 7 miles of ditch, flume, and pipe-line; the latter is 18″ diameter and 1 mile long, crossing the Sacramento River on a suspension bridge. The water is delivered under 220′ pressure to a Knight wheel. The ditch and flume (5′x 3′) have a capacity of 120 inches, but after July the evaporation prevents that amount from reaching the mill, requiring the hanging-up of part of the stamps. Forty-one men are employed. An incorporated Polish company, of Chicago, owner; Dr. K. W. Medowicz, of Redding, president and superintendent.

Copley and Diamond King Mine (Quartz).—It is at Copley, at 700′ elevation, and contains two locations on a vein 3′ wide, trending N.W., and dipping 60° N.E., between porphyritic walls. The developments include some open cuts, a 250′ tunnel on the vein, and an upraise. Two men are employed. J. R. King, of Copley, owner.

Corinne Mine (Quartz).—See Salt Creek.

Cortez Mine (Quartz).—See our XIIth Report, p. 70, where this mine was erroneously inserted under "Copper." It is 9 miles S.W. of Round Mountain. Idle. A. J. Cook, of Eilers, owner.

Crown Point Mine (Quartz).—It is 6 miles W. from Delta Station, at 2,300′ elevation, and comprises three claims. The vein is 2′ wide, trends E. and W., and dips 65° S., between diorite and trachyte walls. There are two tunnels on the vein, 45′ apart, 300′ and 70′ long, respectively; the latter is connected by a 140′ upraise with the surface. The ore carries 4% sulphurets. Two men are employed. L. Johnson, of Delta, owner.

Crown Point Consolidated Gold Mining Co.'s Mines (Quartz).—They are S.W. of Redding, at 1,400′ elevation, and comprise three claims, here designated as the *Crown Point*, *Jeannette*, and *Midnight*, besides some claims near Shasta. The 3′ vein has a N.W. and S.E. course, and dips 45° E., between slate walls. The developments consist of a 100′ shaft on the Midnight, one 47′ deep on the Crown Point, and one of 20′ on the Jeannette; also a 100′ cross-cut on the Midnight. A tunnel is now being driven on the Crown Point. The outcrop shows free gold, but 40′ below the ore becomes heavily sulphuretted. Seven men are employed. Parker, Fowler, Walters, et al., of Oakland, Alameda County, owners.

Daisy Mine (Quartz).—It is on Highland Mountain, 5 miles N. of French Gulch, at 3,300′ elevation, and consists of a tunnel-right. To date the tunnel is in 850′, and is being continued to the porphyry and slate contact. A 120′ air-shaft is 340′ from the mouth. Only a few quartz stringers have been cut so far. C. Smith, J. & D. Southerland, of French Gulch, and J. Earle and G. Reinhauss, of Shasta, owners.

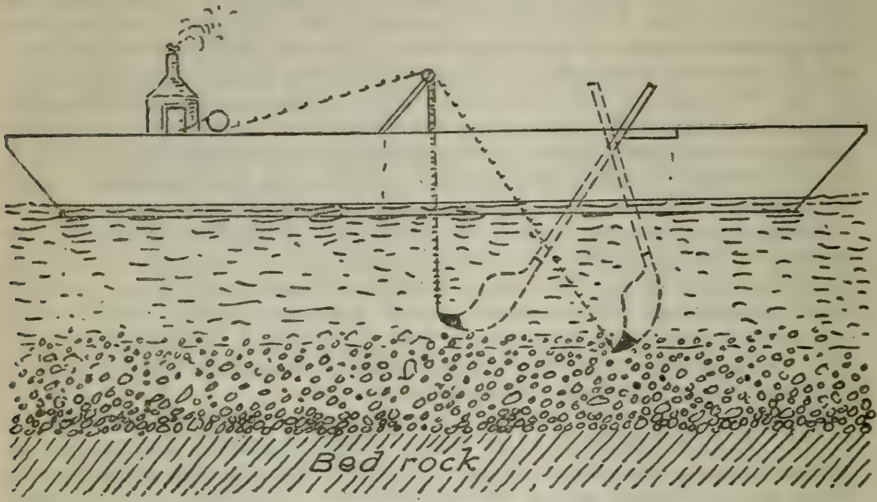
Dayton Mine (Quartz).—See Diamond.

Deakin & Taylor (*Old Spanish*) *Mine* (Quartz).—See our XIIth Report, p. 246. It is 5 miles west of Redding, at 850′ elevation, and comprises several claims, designated as the *Enright*, *South*, *Spanish*, and *Taylor*. The present workings are on the Spanish vein, of 3′ average width, which trends N. 70° E. A 4′x 8′ perpendicular shaft, 90′ deep, shows a vein in the bottom 8′ wide, carrying 1½% of high-grade sulphurets. On the Taylor vein, coursing N. 70° W., is a 200′ tunnel connecting with a 65′ shaft. On the south lode, coursing N. 55° E., is a tunnel 125′ long, and on the Enright, coursing N. 82° W., is a 140′ tunnel on the vein. Eight men are employed. Deakin & Taylor, of San Francisco, owners; J. C. Frick, of Shasta, superintendent.

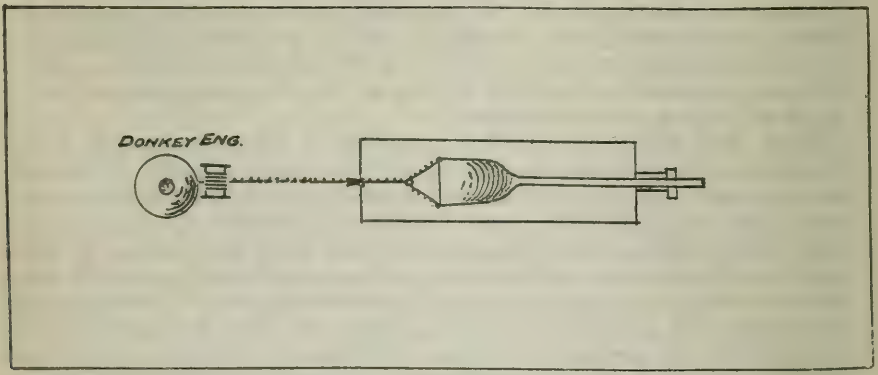
Delta Mine (Quartz).—It is 5 miles W. of Delta Station, at 2,000′ elevation, and comprises two mining and two timber claims. The well-mineralized 3′ vein trends E. and W., and dips slightly S., between slate and diorite walls. A 250′ cross-cut to the vein gives 85′ of backs, and has been drifted 250′ on the vein, proving 150′ of a pay-shoot. A little stoping, 35′ above the drift, has been done. A second tunnel 125′ long has been driven on a parallel vein. The ore carries about 3% of high-grade sulphurets, and is reduced in a 12′ arrastra, run by a horizontal water-wheel under 50′ pressure, crushing 1,400 lbs. at a charge. They save 1,500 lbs. of sulphurets (concentrates) per month on 48′ of 24″ carpet. Water is obtained from Dog Creek through ¼ mile of ditch, with a capacity of 250 inches. Three men are at work. M. B. Butler, of Bayles, owner.

Delta Lava Cap Mine (Drift).—It is ¾ mile from Delta Station, at 1,450′ elevation, and comprises 20 acres between the Sacramento River and Dog Creek. The gravel shows regular river-wash, and is apparently a former bench of the Sacramento River, lava-capped, and carrying coarse gold. A 130′ bedrock tunnel has been driven and a 30′ upraise made into the gravel, but no gangways or breasts have been laid off. Two men are at work. G. K. Deming et al., of Redding, owners.

Diestelhorst Dredger.—In the Sacramento River, near Middle Creek Station, 3 miles above Redding, is a dredger, anchored in the middle of the river, which raises the bottom gravel with a scoop having a shear steel bit and a capacity of ⅓ cu. yd., and deposits it on vibrating screens that drop the waste back into the river, while the finer material is led to a string of sluices with riffles to catch the gold; the tailings drop over the side near the stern. The scoop is attached to a stout, long arm (3″ x 25′), and fastened by chains operated by steam winches that permit it being dropped into the river between two sections of the boat. When dropped into the water the current carries the scoop backward while sinking until it rests, bit downward, on the gravel, and the arm rests against the cross-tie uniting the two sections of the dredger. The scoop is then forced forward by steam-power into the gravel with a strain equal to 3,000 lbs., and raised with its load of gravel by a chain



DIESTELHORST DREDGER.



derrick, swung around on a turntable above the apron and screen, where it is dumped by hand. The gravel is said to be 7′ thick, and the fact that several more dredgers are being built and placed in the rivers would prove that they are remunerative. Seven men work night and day. Diestelhorst Bros., of Redding, owners.

Diamond (*Dayton*) *Mine* (Quartz).—It is 6 miles N.W. from Igo, at 2,350′ elevation, and embraces three full claims, designated as the *Diamond*, *Extension*, and *North Hope*, and a fraction of the *Manzanita*. The veins vary from 6″ to 4′ in width, trend N.E., and dip about 30° S.E., in a cross-grained granitic rock. The vein-filling is partly granite. The developments consist of a 300′ tunnel, a second one started lower down, and a shaft started to connect the two tunnels. Two men are at work. S. W. Robinson, of Igo, owner.

Doeblein's Mine (Hydraulic).—See our XIIth Report, p. 247. It is 2 miles E. of Igo, at 1,200′ elevation, and comprises 60 acres of gravel overlying a conglomerate, which serves as bedrock. This gravel is tight, with somewhat "rusty," scaly gold throughout, and carries considerable clay. The gravel is worked in a bank from 12′ to 25′ in thickness in several cuts, the chief one being 125′x 150′x 25′. This, with adjoining ground, containing 400 acres, is bonded to parties who are bringing in a 10-mile ditch from Bowlder Creek of a capacity of 1,000 miner's inches, to be delivered generally under 200′ pressure. John Doeblein, of Igo, owner.

Dog Creek Ancient Channel Drift Gravel (*Alphabetical*) *Mine* (Drift).—It is situated 1 mile W. of Delta, at 1,700′ elevation, and contains 160 acres of an ancient channel, supposed to be part of the old Sacramento River drainage. A bedrock tunnel is being driven on the north bank of Dog Creek under a lava-capped ridge, and is now 180′ long; at 140′ an upraise has been started to locate the position of the channel. The lava cap is about 25′ thick, lying generally directly on the gravel, only a few spots showing intervening pipe-clay. Four men are at work. An incorporated company, of Redding, owner; C. E. Brown, of Delta, superintendent.

Dolcoath Mine (Quartz).—See our XIIth Report, p. 247. It is 2 miles E. of Shasta. H. A. Wiser et al., of Shasta, owners.

Dreadnaught Mine (Quartz).—See our XIIth Report, p. 247. It is 3 miles N.W. from Shasta. A. T. Molin, of Shasta, owner.

Dry Creek Tunnel and Fluming Co. (Hydraulic).—See Hardscrabble.

Eagle Bird Mine (Quartz).—See Harrison Gulch.

Eastern Star Mine (Quartz).—See our XIIth Report, p. 247. It is 14 miles S.W. from Redding. J. W. George, of Igo, owner.

Edna B. Mine (Quartz).—See our XIIth Report, p. 247. It is 3 miles S.E. of Shasta, at 850′ elevation. Since our last Report the tunnel has been extended to 325′ in length, and some stoping done. A steam arrastra, 8′ in diameter, with self-feeder and continuous discharge, crushing 4 tons in twenty-four hours and driven by a 10 H.P. engine, has been placed within 300′ of the tunnel mouth, and connected therewith by tramway. J. H. Beecher, of Anderson, owner.

El Dorado and Eureka Mine (Quartz).—See our XIIth Report, p. 247. It is near the Tower House, 3 miles S. of French Gulch, at about 3,000′ elevation, and comprises two claims. The principal vein trends N.W. and S.E. on the slate and porphyry contact. Another vein about 8′ distant, and entirely in the slate, varying from a seam to 2′ wide, pitches toward the other and carries a very high-grade ore. The developments consist of a 150′ tunnel on the vein, giving 125′ of backs, and a 150′ cross-cut tunnel through the porphyry on the west side to the vein, giving 80′ of backs. There is an opportunity of cutting the vein at 1,000′ depth by starting a tunnel from the gulch. The pay-shoot has been traced 200′ at the east end of the claim, and is well mineralized, carrying high-grade copper sulphides. Two men are employed. E. P. Conners, of Redding, owner.

Emigrant Mine (Quartz).—See our XIIth Report, p. 248. It is 7 miles N. of Stella. C. A. Crowell, of Stella, owner.

Empire Mine (Quartz).—It is 13 miles N.W. from Ono, at 4,300′ elevation. The vein, from 6′ to 22′ wide, trends N. 30° W., and dips 55° N.E., between porphyry and slate walls. The quartz is well mineralized, and carries a large amount of ochre. The developments consist of a 140′ tunnel and a 45′ shaft with two cross-cut drifts, 12′ and 22′ long. Three men are employed. J. T. Lockhardt et al., of Ono, owners.

Empire (*Myers*) *Mine* (Quartz).—It is situated 5 miles W. of French Gulch, at 3,025′ elevation, and comprises three claims on an E. and W. vein lying very flat, near the contact of slate and porphyry, where the formation is greatly broken up, it having the appearance of having been crushed over. The trouble caused in timbering shows a constant heavy pressure being exerted to the south. There are four main tunnels, designated No. 3, No. 2, Hoskins, and Bell; they are 327′, 205′, 268′, and 115′ long respectively. The vein, 6′ wide in places, contains considerable clay and a comparatively low grade of ore, with 1½% sulphurets of good grade. The mill is an old 4-stamp steam-power mill, with 850-lb. stamps, crushing 3 tons per stamp through a No. 3 screen. The 8 H.P. engine consumes 1½ cords of wood per day. Eighteen men are employed. Empire Mining Co., of Salt Lake, Utah, owner; J. H. Morton, of French Gulch, superintendent.

Enright Mine (Quartz).—See Deakin & Taylor.

Eureka Tellurium Mine (Quartz)—It is near Middle Creek, 2½ miles W. of Redding, at 630′ elevation, and contains 292 acres. These ores carry quite a percentage of tellurium, and considerable difficulty has been encountered in beneficiating them. Since our last Report. a new process plant has been erected for handling them. The ore is drawn from the tunnel mouth up an incline tramway to the mill, where it is delivered to the rock-breaker and crushed to walnut size, and then dropped into a drying furnace, with an incline hearth, to remove all moisture. The furnace is 5′x 20′, with a hearth of iron plates, under which the products of combustion pass from the grate to the stack. The ore then is crushed dry, a 30-mesh screen being used, and elevated into an agitator, 8′ in diameter, where chemicals (a secret solution) are intimately mixed with the ore. The pulp is then passed into two rotating, egg-shaped iron barrels with hollow trunnions. These barrels are 3′x 4′ inside, and weigh 7,000 lbs. each; each contains 16 steel balls, 6″ in diameter. After being charged the barrels are rotated from 4 to 12 hours, according to the amount of tellurides contained, but more especially with reference to the amount of coarse gold; the coarser the gold the longer the time required. The pulp is finally emptied into a steam filter, 4′ in diameter, capable of holding 2 tons of pulp. The filter consists of 10-oz. duck spread over a wire gauze, through which the pulp is forced under 100 lbs. pressure of steam. The clear solution is passed into two 3′x 3′x 16′ precipitating vats, lined with galvanized iron, while the residue (pulp) is discharged into a car beneath the filter and conveyed to the dump. The gold is precipitated from the solution by means of amalgamated aluminum plates suspended in the tanks, 10 in each tank, and, gathering in the bottom as a brown powder, is collected and melted in the usual way. It is claimed that 87% of the assay value of the ore is recovered. The power is furnished by a 50 H.P. engine supplied by a 100 H.P. and a 50 H.P. boiler. After precipitation the chemical solution is pumped back, restored to its original strength, and used over again. Cyanide of potassium and caustic soda form part of the solution. It requires 5 men to handle the mill. Peter J. Sherer et al., of Redding, owners.

Extension Mine (Quartz).—See Bowery Belle.

Falls Mine (Quartz).—See our XIIth Report, p. 248. It is 4 miles W. from Igo, at 2,150′ elevation. Since our last Report, 50′ of shaft and 40′ of tunnel have been excavated; this, with a little stoping, has kept the mill running part of the time. One man is at work. E. L. Ballow, of Igo, owner.

Florida Mine (Quartz).—See our XIIth Report, p. 248. It is situated 3 miles S. of Shasta. G. W. Boswell, of Shasta, owner.

French Gulch (*American*) *Mine* (Quartz).—It is 3¾ miles N.W. from French Gulch, at 2,550′ elevation, and embraces four claims or 320 acres, with veins bearing N.E. and varying from 4½′ to 7½′ in width, between porphyry and slate. There are several tunnels on the property; from the lowest one, a 600′ cross-cut, a drift extends 100′ eastward and shows a 4′ vein at the breast. Closed by litigation. An incorporated company, owner; — Richardson, of Redding, superintendent.

Gage & Martin Mine (Quartz).—It is 1½ miles S. from Shasta, at 800′ elevation, and comprises 80 acres. The 16″ vein trends E. and W., and dips 45° N., between slate and syenite. The developments consist of a 140′ tunnel on the vein and a 45′ incline. Two men are at work. Gage & Martin, of Redding, owners.

G. A. R. Mine (Quartz).—See McCarthy, Saeltzer & Smith.

Gardiner Bros.' (Red Hill) Mine (Hydraulic).—See our XIIth Report, p. 255. It is ½ mile N.E. from Ono, and contains 60 acres of hard, cemented river-wash. Since our last Report, the owners have cut a new ditch ¾ mile long, 30″ wide at bottom and with 1″ fall to the rod, from Eagle Creek. Its capacity is 500 inches, delivered under 170′ pressure. The company has thus secured free water for several months in the year; for the remainder of the season the Hardscrabble ditch furnishes water for 2½ cents per inch for twelve hours. The stone restraining dam was washed out last season by a cloudburst, and has been replaced by one large brush-and-log dam, 65′ long and 15′ high, and six smaller ones above it in Pan Gulch. The cut has been extended about 150′ in length and 50′ wide, showing granite bedrock to be pitching S.W. at an angle of 35°. Three men are at work. Gardiner Bros., of Ono, owners.

Gladstone Mine (Quartz).—See our XIIth Report, p. 248. It is 5 miles N.E. from French Gulch, at 2,325′ elevation, and includes nine claims. The mine has been closed nearly two years by litigation, and has only been recently reopened. Renewed legal troubles have once more closed it. While operating, the drain and the main Gladstone tunnel, 200′ above, were pushed ahead, employing forty-seven men. An incorporated company, of Cleveland, Ohio, owner; F. Brightman, of French Gulch, superintendent.

Gold Bar Mine (Quartz).—It is on the head of J. I. C. Gulch, 4 miles N.E. from French Gulch, at 3,000′ elevation, and comprises six claims. The vein, averaging 3′ wide, trends N.E. and S.W., and dips 70° N., between a porphyry hanging-wall and a slate foot-wall. The vein prospects for a continuous distance of 2,000′ along the outcrop. The developments consist of several shafts, 8′ to 10′ deep, along the course of the vein, and a 240′ cross-cut tunnel, which needs extending 60′ to cut the vein; 80 acres of timber land belong to the property and free water out of J. I. C. Gulch may be secured for part of the season. Five men are employed. Ellis, Porter & Co., of French Gulch, owners.

Gold Coin Mine (Quartz).—See Salt Creek.

Gold Hill Mine (Quartz).—See Harrison Gulch. It lies at 3,740′ elevation. There are two tunnels, 180′ apart; the upper one, 40′, and the lower one, 90′, are being driven ahead. Four men are at work. Fowler, Rhodes & Benton, of Middle Fork, owners.

Gold Hunter Mine (Quartz).—See Harrison Gulch.

Gold Leaf Mine (Quartz).—It is 3 miles N.W. from Redding, at 2,300′ elevation. The vein varies from 1′ to 8′ in width, trends N.W. and S.E., and dips 40° S.W., between diorite walls. The developments are a 90′ shaft and a 224′ tunnel, in the wall rock, and two drifts therefrom in ore, 102′ and 41′ long. Two men are at work. W. P. Miller, of Middle Creek, owner.

Golden Chariot Mine (Quartz).—See Niagara.

Gossan Mines (Quartz).—They are 3 miles W. from Delta Station, at 3,600′ elevation, and consist of a group of locations, known as Nos. 1, 2, and 3, on a mineral outcrop 80′ wide, carrying copper, iron, gold, and silver. The trend is N.E. on a contact between slate on the W. and a trachytic rock on the E. Only assessment work has been done. Sanders & Brown, of Delta, owners.

Grab Mine (Quartz).—See Stowell.

Gray Fox Mine (Quartz).—See Harrison Gulch. It lies at 3,150′ elevation. An ochre seam along the wall is rich in free gold. A cut 30′ long has been made on the outcrop, and a tunnel, now 30′ long, is being driven. A Kendall mill, just completed, is run by steam-power, and crushes 6 tons per day. Five men are employed. W. R. Conant et al., of Castella, owners.

Green Mine (Quartz).—See our XIIth Report, p. 249. It is 3½ miles W. from French Gulch, at 3,300′ elevation, and comprises three locations on a N. and S. vein. Since our last Report the lower tunnel has been advanced 100′ and an upraise of 40′ made from the same; a 120′ cross-cut tunnel near the summit of the ridge has also been made to the vein. Nine men are employed. — Kelley et al., of French Gulch, owners.

Grover Cleveland Mine (Quartz).—See Harrison Gulch.

Gypsy Gold and Silver Mine (Quartz).—See our XIIth Report, p. 249. It is 2 miles S.W. of Shasta, at 750′ approximate elevation. J. B. Timmonds, of Redding, owner.

Hall's Mine (Quartz).—It is on the divide between Jerusalem and Cottonwood creeks, 10 miles N.W. of Ono, an 3,200′ elevation. The two locations on the 14″ vein trend N.E. and S.W., and dip S.E., between serpentine and slate. The vein carries considerable ochre and some copper sulphides. In October, 1895, there was a 15′ shaft, and a cross-cut was started to cut the ledge. Three men are at work. W. Hall and J. Landers, of Ono, owners.

Hardscrabble (*Dry Creek Tunnel and Fluming Co.'s*) *Mine* (Hydraulic).—See our XIIth Report, p. 249. It is ½ mile E. of Igo, and comprises 1,700 acres. Being enjoined from working by the hydraulic process, several points on the face of the bank are being drifted by lessees. Eight men are at work. Dry Creek Fluming and Tunnel Co., of San Francisco, owner; R. G. Harvey, of Igo, manager.

Harrison Gulch Mines (Quartz).—This group is situated in the southwest portion of Shasta County, near the Trinity and Tehama county line, 55 miles due W. from Cottonwood, at 3,000′ to 3,600′ approximate elevation, and consists of the following locations: *Bee-Gum*, *Black Bear*, *Eagle Bird*, *Gold Hill*, *Gold Hunter*, *Gray Eagle*, *Gray Fox*, *Grover Cleveland*, *Knob Hill*, *Lost Mine*, *Lucky Baldwin*, *Newtown*, *N.W. Extension of Bee-Gum*, *N.W. Extension of Gold Hill*, *N.W. Extension of Lucky Baldwin*, *Red Fox*, *S.E. Extension of Lucky Baldwin*, and *Wilbur*. The three principal veins were discovered in the summer of 1895 and are designated the *Bee-Gum*, *Gold Hill*, and *Lucky Baldwin*. The veins generally trend N.W. and S.E., and dip 60° N.E., in slate formation, near the contact with serpentine, and are about 400′ apart. The Bee-Gum lies N.E. of the Gold Hill and Lucky Baldwin. The vein averages between 2′ and 3′ in width. The quartz carries ochery matter, with but few sulphurets near the surface, and yields well in free gold in the arrastra. The veins have been traced from Harrison Gulch, a feeder of the Middle Fork of Cottonwood Creek, across the dividing ridge into Trinity County.

Hartman Mine (Quartz).—See our XIIth Report, p. 250. It is 3½ miles N. of Stella. W. Hartman, of Stella, owner.

Hidden Treasure Mine (Quartz).—See Niagara.

Hidden Treasure Mine (Quartz).—See our XIIth Report, p. 250. It is situated 8 miles N.E. of Shasta, on the Iron Mountain road. In litigation.

Holman Mine (Quartz).—It is near Flat Creek, 2 miles S.W. of Copley, at 2,000′ elevation, and consists of two claims, on a N.W. and S.E. vein, 2′ wide, which dips 70° E., between porphyry walls. The quartz carries iron and copper pyrites, and is worked, through a 75′ cross-cut tunnel to the vein and a 25′ incline, by one man. J. Holman, of Copley, owner.

Indiana Mine (Quartz).—It is on Motion Creek, near Copley, at 1,150′ elevation, and comprises four locations, designated the *Bay State*, *Indiana*, *Last Chance*, and *Sunrise*. The principal vein on the Last Chance claim courses N.W. and dips about 60° N.E., with a width of 4′, and is developed with a 20′ incline with short drifts on the vein. A second 18″ vein on this claim trends E. and W., and has a 50′ shaft on the east end. On the Indiana claim are six small parallel E. and W. veins, dipping 50° N., opened by a cross-cut 135′ long, while a 20′ incline on the south end of the Indiana proved a N. and S. vein, 10′ wide, dipping 10° E. The Bay State claim has merely a short, open cut. Two men are employed. P. N. Roan et al., of Copley, owners.

Industry Mine (Quartz).—See Bowery Belle.

Iron Mask Mine (Quartz).—See our XIIth Report, p. 250. It is 6½ miles from Stella, and comprises six claims. Mine and mill idle. S. W. Levy, of San Francisco, owner.

Jackson Mine (Quartz).—See Billy McCormick.

Jay Eye See Mine (Quartz).—See our XIIth Report, p. 250. It is 4 miles N.E. from French Gulch, at 2,500′ elevation, and comprises several claims. Three men are at work. Van Meter, Fox, et al., of French Gulch, owners; J. Johnson, superintendent.

Jeannette Mine (Quartz).—See Crown Point Cons. G. M. Co.

Jerusalem Mine (Quartz).—It is in Sec. 9, T. 31 N., R. 8 W., on Bully Choop Mountain, at 5,350′ elevation. The vein is 30′ wide, trends N.W., and dips N.E., between slate and trachyte. Developments consist of two tunnels 40′ apart; the upper one is a 300′ cross-cut to the vein, with a 65′ drift; the lower one is in 83′ on the vein. A 33′ air-shaft will tap No. 1 tunnel. Two men are at work. J. T. Lockhardt, of Ono, owner.

Jerusalem Bar Mine (Hydraulic).—It is on Jerusalem Creek, 9 miles W. of Ono, at about 3,000′ elevation, and comprises 30 acres of ground. The cut is 50′x 75′ and the gravel is about 20′ deep, and carries many bowlders, which must be blasted. The gold is coarse, and mostly on the bedrock. Water is obtained from Jerusalem Creek through ½ mile of ditch, and delivered under 60′ pressure, through 200′ of 8″ pipe, to a No. 1 giant. The tail-flume is 100′ long and 18″ wide, and paved with Hungarian and pole riffles. Three men are at work. J. Barnes and J. Moon, of Ono, owners.

Jim Fisk Mine (Quartz).—See our XIIth Report, p. 251. It is 3 miles N. of Igo. Mill invented by owners. Mine and mill are idle. E. Jones and H. C. Christensen, of Igo, owners.

Joe Davis Mine (Quartz).—It is 11 miles W. of Ono, on Jerusalem Creek, at 4,500′ elevation. The vein, from 14″ to 18″ wide, trends N.W., and dips 60° E., in slate rock. A shaft has been sunk 35′ on the vein. Two men do assessment work only. W. McCormick, of Ono, owner.

Jumbo Mine (Quartz).—See Salt Creek.

Knob Hill Mine (Quartz).—See Harrison Gulch. It lies at 3,500′ elevation. A. J. Fowler and W. R. Conant, of Castella, owners.

Last Chance Mine (Quartz).—See Indiana.

Lava Bed Mine (Drift).—See our XIIth Report, p. 251. It is 5 miles S. of Redding, and comprises 40 acres on Oregon Gulch, in Sec. 15, T. 31 N., R. 5 W. Idle. A. L. Parsons, of Redding, owner.

Lem Jim (*Tom White*) *Mine* (Drift and Hydraulic).—It is 1 mile W. from Igo, at 2,500′ approximate elevation, and contains 45 acres. The gravel bank is worked in two benches, and the bedrock has not yet been reached; the cut is about 60′ deep and 250′ wide, in cemented gravel, without any large bowlders, carrying but little gold, of a fine, scaly nature. The gravel worked last year realized about $700 only. Four Chinamen, during the dry season, drifted into the face of the bank below the second bench, and are in 40′. The company takes water from one of the Dry Creek Tunnel and Fluming Co.'s ditches, using, under 50′ pressure, 300 inches when hydraulicking; at other times they use only 5 inches. There are 500′ of 18″, 15″, and 12″ pipe supplying water to one giant with 2½″ nozzle. The water season lasts 4½ months. The tail-flume of 72 boxes is 2½′ wide, set on a 2½″ grade, and paved with 6″ blocks. The tailings dump into Dry Creek behind four dams (one rock and three brush), 6′, 7′, and 9′ high and 150′ across. The seepage in the pit is removed by a Chinese pump driven by a 6′ overshot wheel. Fifteen Chinese at work during the season. A Chinese company, owner; Lem Jim, of Igo, manager.

Little Maud Mine (Quartz).—It is 7 miles from Shasta, at the eastern base of Iron Mountain, at 2,325′ elevation. The vein is about 2′ wide, courses N.E., and dips 45° N.W., between porphyritic and diorite walls. The quartz carries about 3% of high-grade copper sulphides. The developments consist of three cross-cut tunnels, 107′, 109′, and 295′ long respectively; the last two are connected by a winze, and No. 3 gives about 195′ of backs. The pay-shoot is developed 55′ in length, and pitches W. between walls giving evidence of heavy movement having taken place. The ore is reduced in what is known as a Jones mill, patterned somewhat after a Huntington, only, in place of rollers, hammers strike the outer peripheral ring-shaped die. The pan is 3½′ in diameter, and the mill is run at a speed of 70 revolutions, crushing 6 tons in twenty-four hours. Instead of aprons two cone-shaped amalgam traps receive the pulp while being rapidly revolved within a stationary outer vessel. About 90% of the amalgam is obtained in the mill and 10% in the traps. The entire machinery, including a Frue concentrator, is driven by a 12 H.P. steam engine. Water for the mill is obtained from the mine. Eight men are employed. D. N. Haskell et al., of Redding, owners; P. Murray, of Redding, manager.

Live Oak Mine (Quartz).—It is 4 miles N. of Redding, at 950′ elevation, and is an extension of the original Quartz Hill vein, trending N.W. and S.E., dipping 60° N.E., in slate, and varying up to 10′ in width. Two shallow inclines show the vein to be 5′ to 8′ wide. Two men are at work. W. T. Hyatt, of Buckeye, owner.

Lodi Mine (Quartz).—See our XIIth Report, p. 252. It is 4 miles W. of Igo. Idle. W. D. Bull, of Igo, owner.

Lost Mine (Quartz).—See Harrison Gulch. It lies at 3,100′ elevation. Mar & Crawford, of Middle Fork, owners.

Lost Buck Mine (Quartz).—See our XIIth Report, p. 252. It is 6 miles N.W. of Ono. Idle. H. Arkarro, of Ono, owner.

Lucky Baldwin, S.W. Extension (Quartz).—See Harrison Gulch. It lies at 3,100′ elevation. Two men are at work. J. Fowler and L. Rhodes, of Middle Fork, owners.

McCarthy, Saeltzer & Smith (G. A. R.) Mine (Quartz).—It is 4½ miles N.W. from Redding, at 975′ elevation. The 2′ vein courses N.W. and S.E., and dips 60° N.E. between slate walls. The quartz carries 1% of high-grade sulphurets, with some telluride. It is opened by a 40′ incline and a 30′ open cut connecting with a 40′ tunnel driven toward the incline, which has not yet been reached. Two men at work. McCarthy, Saeltzer & Smith, of Redding, owners.

Mad Mule Mine (Quartz).—See our XIIth Report, p. 252. It is 5 miles N.W. of Stella, and comprises three claims. Since our last Report the tunnels have been extended and a new tunnel started. Four men are at work. Elleigh & Rea, of Stella, owners.

Mad Ox Mine (Quartz).—See our XIIth Report, p. 252. It is 5 miles N. of Stella. Idle. L. Reil and J. W. Woodward, of Stella, owners.

Mammoth Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 568 and 252. It is 8½ miles N. of Redding. Idle. S. Cheney, of Philadelphia, Pa., owner.

Mammoth Mine (Quartz).—This is a prospect on the road between Kennett and Copley. The vein trends N. and S., and dips E. The quartz carries a very large percentage of extremely fine iron sulphides. Idle. Frank Kenyon et al., owners.

Manlove Mine (Quartz).—See our XIIth Report, p. 252. It is 3½ miles N. of Stella. Idle. J. E. Manlove, of Perkins, Sacramento County, owner.

Manzanita Mine (Quartz).—See Diamond.

Mascot Mine (Quartz).—See our XIIth Report, p. 252. It is 2 miles W. of Shasta. Idle. W. Herron, of Redding, owner.

Mechado Mine (Quartz).—See our XIIth Report, p. 252. It is 3 miles N.E. of Igo. Idle. — Mechado, of Igo, owner.

Minnehaha Mine (Quartz).—See Bowery Belle.

Midnight Mine (Quartz).—See Crown Point Cons.

Miner's Dream Mine (Quartz).—See our XIIth Report, p. 252. It is 3½ miles S. of Shasta. W. A. Boswell, of Shasta, owner.

Midwinter Mine (Quartz).—It is 2½ miles N.E. from Redding, at 570′ elevation. The heavy sulphuretted vein, about 4′ wide, courses N.E., and dips 50° W., between slate and porphyry, with a gouge of red clay from 8″ to 10″ wide. The developments consist of an incline, 32′ deep, on the vein. Two men are at work. T. Harrison, H. B. Jackson, and J. Booth, of Buckeye, owners.

Moline Mine (Quartz and Placer).—It is 3 miles N. of Shasta, and contains five claims, including quartz veins and a placer, at 1,175′ elevation. The veins have a general N.E. course and dip 45° S.E., along a contact of porphyry and quartzite, averaging 30″ in width. Developments consist of an open cut, 40′ long, on the croppings; a 60′ cross-cut tunnel to the vein, and a 10′ incline; the tunnel gives 25′ of backs. At the depth attained the quartz is mixed considerably with clay. It is provided with a 10′ arrastra run by an 18′ overshot wheel with 22″ breast, which crushes one ton per day; the water is derived from the north branch of South Fork of Spring Creek, through 300′ of ditch of 180 miner's inches capacity. The placer claim is below the arrastra on a former bench of Spring Creek. The gravel is 5′ to 6′ deep, filled with large bowlders occupying a narrow channel, and requiring the use of a hand derrick with 26′ mast and 22′ boom. The water season lasts five months. The tail-flume is paved with rocks, and set on a 9″ grade. A clean-up is made once in a season. Two men are employed. Mrs. Moline, of Shasta, owner.

Mountain Mine (Quartz).—See Alvina.

Mountain Top Mine (Quartz).—It is 5 miles W. from Redding, at 750′ elevation. The 7′ to 10′ vein trends N. and S., and dips E., between syenite and diorite walls. A 70′ tunnel has been run on the vein. Two men are at work. J. W. Copeland, of Redding, owner.

Murray Mine (Quartz).—See our XIIth Report, p. 253. It is 2½ miles S.W. of Copley. Idle. Barney Conroy, of Redding, owner.

Myers Mine (Quartz).—See Empire.

Nelson Gold Mine (Quartz).—See our XIIth Report, p. 253. It is on Grizzly Gulch, 7 miles N. of Stella. Idle. C. A. Nelson, of Stella, owner.

Newtown Mine (Quartz).—See Harrison Gulch. It lies at 3,100′ elevation. Rhodes, Benton & Co., of Middle Fork, owners.

New Year and Australian Mine (Quartz).—It is 1½ miles N. of Shasta, at 1,050′ elevation, and comprises two claims. The New Year vein courses E. and W. in porphyritic granite, and has a 50′ incline and 25′ drift on the 5′ vein carrying 1% of high-grade sulphurets. The Australian is a 5′ vein running N. and S. Two men are at work. Cunningham & Garrechty, of Shasta, owners.

Niagara Mine (Quartz).—See our Xth and XIIth Reports, pp. 636 and 253. It is 5 miles W. from French Gulch, at 2,810′ elevation. The company have leased several of their twenty-two claims. Two of the claims, known as the *Hidden Treasure* and *Golden Chariot*, are leased to W. H. Chynotteth, of Shasta, who is opening a 3′ sulphuret vein. Halliday & Fox, lessees, are driving a tunnel on the *Scorpion* to get into some old workings known to contain rich seams. The *Summit* is being exploited by two lessees, on 75% basis. At time of our last Report, the pay-shoot in the Niagara Mine proper had been cut off by a cross dike (header), all the pay being on the east side; in crossing this header, to the W. and 25′ below, a large body of pay-ore has been opened out. Later, through an error of 22′ to the north, in surveying for a connection of this portion of the mine with an upraise from the lowest, or O'Neil, tunnel, a hitherto unknown body of ore, 8′ wide, has been uncovered. The pay-ore on the west of the header has a porphyritic appearance, is strongly mineralized, and carries quite an amount of lime. The mill was not running, but was to be started soon. Forty-five men are at work. An incorporated company, of New York, owner; R. E. Hanley, of French Gulch, superintendent.

North Hope Mine (Quartz).—See Diamond.

N.W. Extension of Bee-Gum Mine (Quartz).—See Harrison Gulch.

N.W. Extension of Gold Hill Mine (Quartz).—See Harrison Gulch.

N.W. Extension of Lucky Baldwin Mine (Quartz).—See Harrison Gulch.

Original Gravel Mine (Drift).—See our XIIth Report, p. 254. Abandoned.

Original Quartz Hill Mine (Quartz).—See our XIIth Report, p. 254. See Consolidated Kosciusko.

Old Spanish Mine (Quartz).—See Deakin & Taylor.

Phœnix Mine (Quartz).—See Salt Creek.

Potosi Mine (Quartz).—See our XIIth Report, p. 254. It is 12 miles S.W. of Redding. Idle. Senator J. P. Jones, of Gold Hill, Nev., owner.

Pugh & Lindsay Mine (Quartz).—See our XIIth Report, p. 254. It is on Clear Creek, 3 miles W. of Shasta. — Pugh et al., of Shasta, owners.

Quail Mine (Quartz).—See Alvina.

Rattler (*Minnesota*) *Mine* (Quartz).—See our Xth and XIIth Reports, pp. 635 and 255. It is 3½ miles W. of Copley. Idle. Parmelee Ore Concentrating Co., of Chicago, Ill., owner.

Red Cloud Mine (Quartz).—See our XIIth Report, p. 255. It is 4 miles W. of Igo. Idle. — Hubbard et al., of Igo, owners.

Red Fox Mine (Quartz).—See Harrison Gulch. It lies at 3,150′ elevation. W. R. Conant, of Castella, A. J. Fowler, of Middle Fork, et al., owners.

Red Bluff Mine (Quartz).—It is 15½ miles N.W. of Ono, at 5,500′ elevation. It lies N.E. of and adjoins the Cleveland Consolidated Mine, the same vein passing through both claims. The vein is from 6′ to 8′ wide, between slate and trachyte walls. The developments consist of three tunnels, 150′, 60′, and 30′ long, and a short winze on the vein. Two men do assessment work. Murray Estate, of Ono, owner.

Red Hill Mine (Hydraulic).—See XIIth Report, p. 255. See Gardiner Bros.

Remonia (*Colorado, D. & B.*) *Mine* (Quartz).—See our XIIth Report, p. 256. See Colorado Mine. It is 4 miles S.W. of Redding. Idle.

Richmond Mine (Quartz).—See our XIIth Report, p. 256. It is 3½ miles W. of Igo. Idle. J. B. Wright, of Igo, owner.

Rickard Mine (Quartz).—It is 5½ miles W. of Delta, at 2,300′ elevation, and comprises two claims. The vein courses E. and W., and dips about 60° S., in a porphyritic rock, and carries 4½% of sulphurets. The gangue consists partly of feldspar. A 240′ tunnel starts from the bank of Dog Creek, just above high-water level, disclosing a 5′ vein. Idle at present. Two men work the mine. — Rickard, of Delta, owner.

Sacramento Pliocene Mine (Drift).—See our XIIth Report, p. 256. It is in Sec. 15, T. 31 N., R. 5 W., in Oregon Gulch, 5 miles S.W. of Redding. Idle. Dr. L. A. McLane, of Sacramento, owner.

Salt Creek Mines (Quartz).—See our XIIth Report, p. 256. This group is 4 miles W. of Redding, at 450′ elevation, and comprises the *Bonanza*, *Corinne*, *Gold Coin*, *Jumbo*, and *Phœnix*. Since our last Report an arrastra, 10′ in diameter and continuous discharge, has been built. It is run by water-power obtained from Salt and Flat creeks, through a ditch 1 mile in length, 2′ wide on top, 1½′ deep, with ¼′ grade per rod. The season lasts eight months. A 50′ tunnel on the east end and an 80′ tunnel farther west, on the Bonanza claim, have been driven. Four men are at work. E. P. Conner, of Redding, owner.

Sanders & Vollmar Mine (Quartz).—It is 5½ miles W. of Delta, on Dog Creek, at 225′ elevation at lower level. Two parallel veins, about 2′ wide and heavily sulphuretted, course E. and W., and dip 60° S., between porphyry walls, with a gouge on the foot-wall. Three tunnels, 40′, 150′, and 100′ long, have been driven from the banks of Dog Creek. One man is at work. — Vollmar, of Trinity Center, and — Sanders, of Delta, owners.

Santa Rosa Mine (Quartz).—See Bullard & Vandever.

Scottish Chief Mine (Quartz).—See Bullard & Vandever.

Schuyler Mine (Drift and Hydraulic).—See our XIIth Report, p. 256. It is ¾ mile from Igo. Idle. A Chinese company, owner.

Scorpion Mine (Quartz).—See Niagara.

Shasta Mine (Quartz).—See Annie.

Slatonas Mine (Quartz).—It is on McCall ranch, 4 miles W. of Delta, at 2,100′ elevation, and comprises two claims on a 2′ vein carrying high-grade sulphurets, trending N. and S., and dipping 80° E., on the contact between slate and syenite. The vein is developed through three tunnels, 30′, 100′, and 256′ long; the latter is a cross-cut for 106′, and furnishing 108′ of backs. Two men are at work. Bard & Hunter, of Delta, owners.

Snider Mine (Quartz).—See Clipper and Snider.

South Mine (Quartz).—See Deakin & Taylor.

S.E. Extension of Lucky Baldwin Mine (Quartz).—See Harrison Gulch.

Spanish Mine (Quartz).—See Deakin & Taylor.

Spardy Mine (Quartz).—See our XIIth Report, p. 257. It is on Flat Creek, 2½ miles S.W. of Copeley. Barney Conroy, of Redding, owner.

Spellman Mine (Quartz).—See our XIIth Report, p. 257. It is 3 miles S.W. of Copley. J. S. Spellman et al., owners.

Spring Gulch Mine (Quartz).—See our XIIth Report, p. 257. It is 7½ miles N.W. from Stella. L. Reil et al., of Stella, owners.

Stowell (*Grab*) *Mine* (Quartz).—It is 7 miles, by trail, S.W. from Copley, facing Spring Creek, at 3,100′ elevation at the main tunnel, and comprises seven claims. The formation and trend are identical with the ore-bodies of the Iron Mountain Mine, of which it is a continuation. There is a 40′ tunnel, besides some cuts and openings. One man is at work. J. H. Stowell, of Copley, owner.

Sugar Loaf Mine (Quartz).—See our XIIth Report, p. 257. It is 4 miles W. of Redding. Idle. E. D. Hendricks et al., of Redding, owners.

Summit Mine (Quartz).—See Niagara.

Summit Mine (Quartz).—It is 7 miles from Ono, at 4,500′ approximate elevation. The vein, 1′ to 4′ wide, trends N.W. and S.E., and dips S.E., between porphyry and slate, carrying large quantities of ochery ore of a high grade. There are three tunnels on the vein, and it is intended to start a lower one.

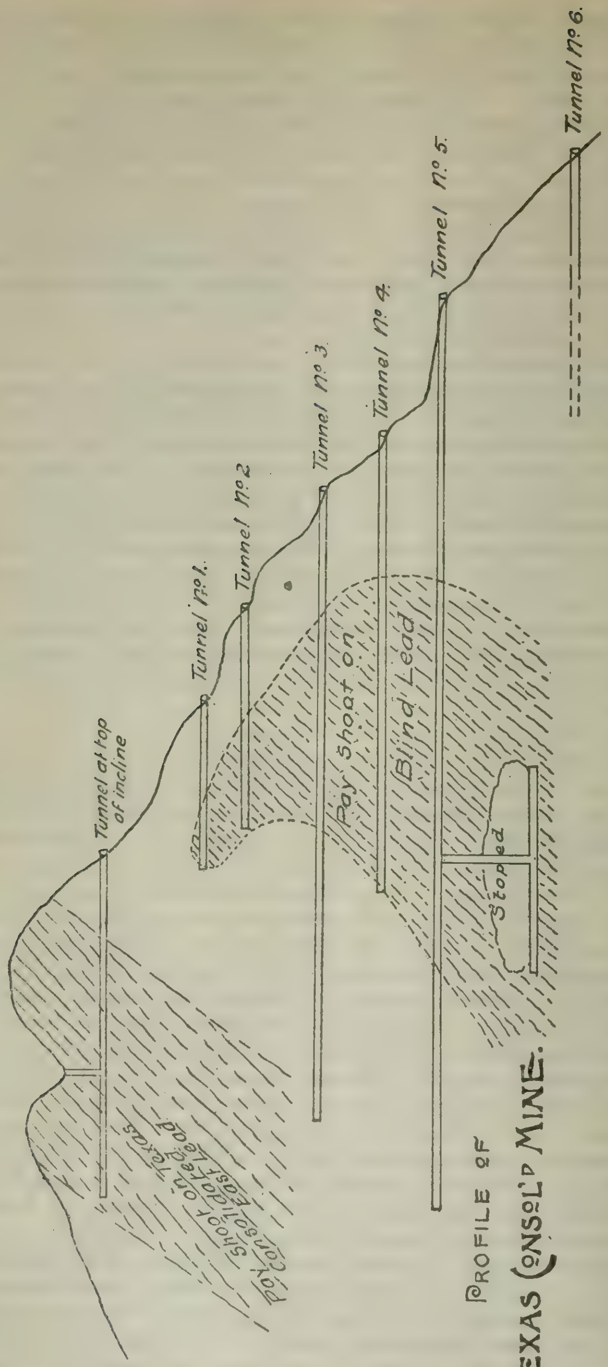
Summit Mines (Quartz).—They are 5 miles W. of French Gulch, at 3,500′ elevation, and comprise five locations on two systems of veins; one trending E. and W., with the general course of the mineral belt of this section, and dipping N.; the other trending N. and S., and dipping 75° E. The formation is porphyry and slate. The width of the veins varies from a few inches to 3′. The developments on the E. and W. veins consist of a 100′ shaft, showing a 6″ vein, tapped at 50′ by a cross-cut 102′ long; on another claim is a 120′ cross-cut and drifts 100′ E. on the vein; on a third vein is a 100′ incline shaft, tapped by a 230′ cross-cut. The N. and S. vein is the same as developed on the adjoining (Tom Green) claim, from where it has been followed. For five months in the year enough water from Summit Creek is available for a 5-stamp mill. Two lessees are at work. F. W. Wheeler and Mrs. Morrell, of French Gulch, owners.

Sunrise Mine (Quartz).—See Indiana.

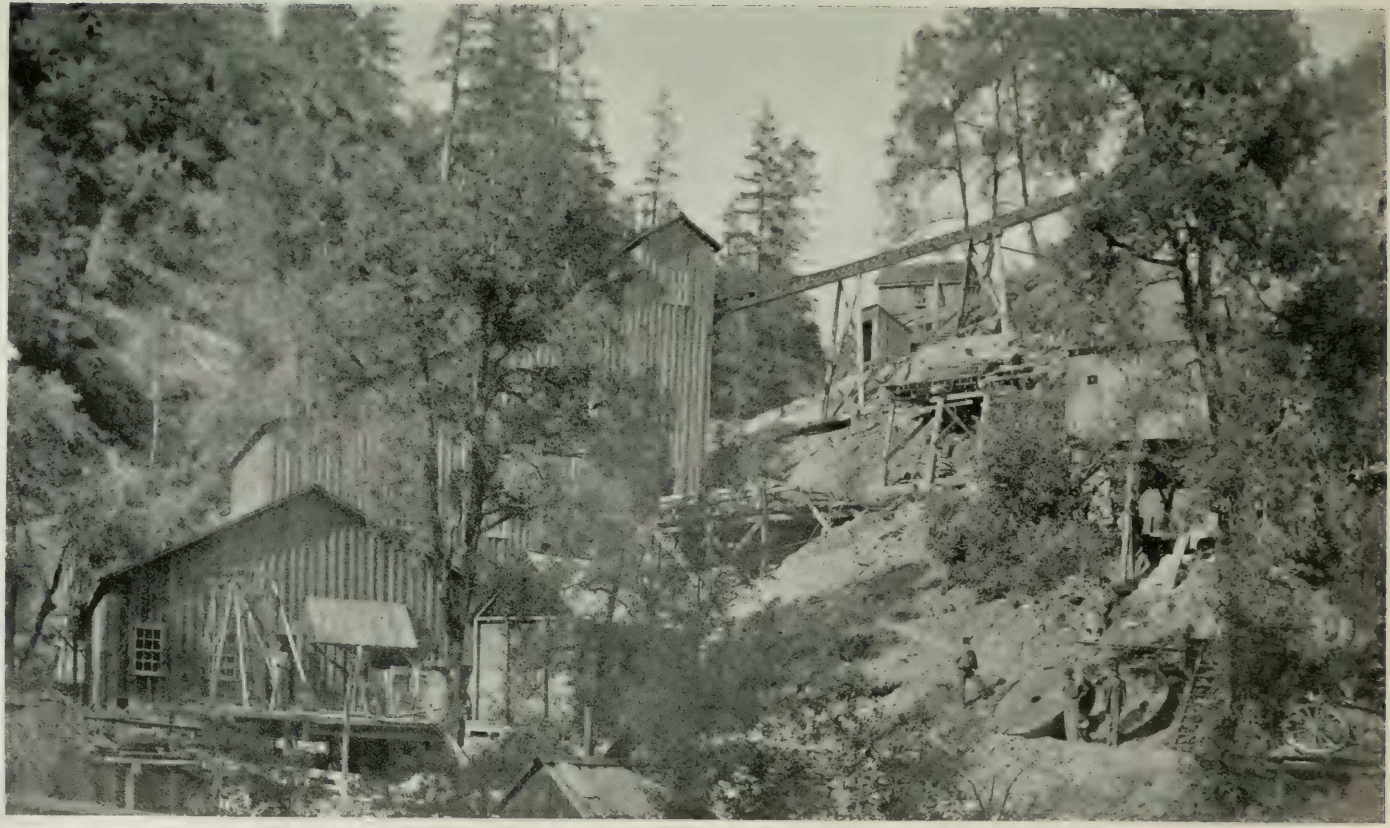
Sunny Hill (*Gray Eagle*) *Mine* (Quartz).—See our XIIth Report, p. 257. It is 7 miles W. from Ono, at 4,500′ approximate elevation. The vein, 1′ to 4′ wide, trends N.W. and S.E., and dips vertically, between slate and porphyry. There are two tunnels and a 80′ winze. Loomis Sharpe and W. Hall, of Ono, owners.

Taylor Mine (Quartz).—See Deakin & Taylor.

Texas Consolidated Mine (Quartz).—See our Xth and XIIth Reports, pp. 629 and 258. It is at Dry Diggings, at 1,180′ elevation, and comprises 519 acres. Since our last Report tunnel No. 5 has been extended under the hill to a total length of 1,600′, and a vertical shaft sunk 162′ below its level, from which an intermediate drift has been opened and stopes started 200′ on the one side and 160′ on the other, opening up a very fine body of ore, 17′ wide in places. A lower tunnel, No. 6, which has just been started, will connect with this shaft at a depth of 225′; the tunnel will be driven by machine drills. The ore for the mill is taken from the sinking of the shaft and from above No. 4 tunnel, and is conveyed to the mill by rope tramway 2 miles in length, which will be abandoned on completion of tunnel No. 6, when a 4,000′ tramway will connect the tunnel and mill. The ore-shoot on No. 5 is 600′ long, and pitches into the hill. A chlorination plant, of 2¼ tons capacity per day, has been added. The bullion yield shows a working result of 92%. The sulphuret yield is 1¼ tons per day, and the concentrates from the canvas plant furnish 6 tons per month. The entire plant will shortly be supplied with electric light. Water used in the mill is pumped from



PROFILE OF TEXAS CONSOL'D MINE.



UNCLE SAM MINE AND MILL.

the Sacramento River. Seventy-five men are employed. An incorporated company, owner; R. G. Hart, president and manager.

Thompson Mine (Quartz).—See our XIth and XIIth Reports, pp. 40 and 258. It is 2½ miles S.W. of Shasta. Idle. — Thompson, of Shasta, owner.

Three Sisters Mine (Quartz).—It is in Dutch Gulch, 2 miles N.W. from French Gulch, at 2,150′ elevation, and comprises four claims. The vein, varying in width from a few inches to 2′, trends E. and W., and dips 60° N., between slate and porphyry walls. Drifts have been run on the vein from both sides of the gulch, 200′ on the east and 110′ on the west. The vein, which was only discovered last summer, carries galena and shows free gold. The mill consists of a Dodge rock-breaker and a 3½′ Huntington roller-mill with self-feeder, crushing 5½ tons in twelve hours; all driven by a 12 H.P. engine. A canvas plant, 30′x 6′, is below the mill. Nine men are at work. E. Ellery & Bros., of French Gulch, owners.

Topknot Mine (Quartz).—It is 5½ miles from Delta, at 2,400′ elevation, and comprises three claims, on three parallel E. and W. veins, averaging 2½′ in width, in grano-diorite. Two tunnels have been driven, the lower one, a 45′ cross-cut, gives 60′ of backs, and the upper one runs 100′ on the vein. A little stoping has been done. A 9′ arrastra, driven by a 16′ overshot wheel with 34″ breast, crushes 700 lbs. at a charge. The water is taken from Dog Creek through 250′ of ditch. The sulphurets are saved on 15′ of carpet 25″ wide, and 12′ of canvas 5′ wide, furnishing about 1 ton of concentrates per month. Two men are at work. Neley Thomas, of Delta, owner.

Tom White Mine (Drift and Hydraulic).—See Lem Jim.

Trinity Consolidated Mine (Quartz).—It is 6 miles W. from Delta, at 2,575′ elevation, and comprises five claims, designated *Last Chance*, *Sitting Bull*, *Stonewall*, *Tehama*, and *Trinity*. The Last Chance, Sitting Bull, and Trinity trend N. and S., and the other two nearly E. and W. The developments are largely confined to the Trinity claim, which dips about 80° E., with an average width of 2½′ between slate and trachyte walls. The quartz carries a fair percentage of iron and copper sulphides. The other developments consist of tunnels driven on the ledge on both sides of the creek, one 80′ on the south, the other on the north; near the mouth of the tunnel is an 80′ perpendicular shaft, with a whip hoist and a pump driven by a 12′ overshot wheel. A 50′ winze in the north tunnel shows a well-mineralized vein 4′ wide. The ore is trammed 1,000′ to the 10-stamp mill, furnished with steam and water power, situated on the bank of the creek. There are two 6′ Frue concentrators and six electric slime-settlers; also, a 210-volt dynamo, furnishing fifteen lights. The capacity of the mill is 2 tons per stamp. Water-power is furnished from Dog Creek, through ½ mile of ditch of 300 miner's inches capacity, delivered under 120′ head, through 150′ of 9″ pipe, on a 5′ wheel. The water season lasts seven months. Fourteen men are employed. An incorporated company, of Red Bluff, Tehama County, owner; A. Vestal, of Bayles, superintendent.

Uncle Sam Mine (Quartz).—See our Xth and XIIth Reports, pp. 639 and 258. It is 7 miles W. from Kennett, at 2,300′ elevation, and comprises seven mining claims and sections of timber land. There are three main pay-shoots, designated the *East*, *Middle*, and *West;* present explorations indicate the probability of a fourth one. Since our last Report, 5 stamps have been added to the mill. The cost of maintenance at this mine is extremely heavy, on account of the very precipitous and rugged nature of the country. Timbers and wood have to be shot down to the required points. Eighty men are employed. Sierra Buttes Gold Mining Co. (Ltd.), owner; S. J. Johns, of Kennett, superintendent.

Utah and California Gold Mine (Quartz).—See our Xth and XIIth Reports, pp. 630 and 259. It is 7 miles N.E. of Redding. Idle. Walker Bros., of Salt Lake, Utah, owners.

Vandever & Bullard Mine (Quartz).—See our XIIth Report, p. 259. It is 2½ miles S.W. of Copley. Idle. Vandever & Bullard, of Copley, owners.

Washington Mine (Quartz).—See our Xth, XIth, and XIIth Reports, pp. 635, 50, and 260. It is 4 miles N.W. from French Gulch, at 2,500′ elevation, and comprises 82 acres. The property has lately changed owners, who are fixing up the mine and mill for work. Twenty-four men are employed. M. J. Luthers, of Streator, Ill., owner.

West End Mine (Quartz).—See our XIIth Report, p. 260. It is 1 mile S. of Stella. Idle. D. B. Hunt et al., of Stella, owners.

West Point Mine (Quartz).—See our XIIth Report, p. 260. It is 3½ miles from Shasta. G. W. Boswell, of Shasta, owner.

World's Fair Mine (Quartz).—See our XIIth Report, p. 260. It is 2½ miles N.W. of Igo. John Doeblein, of Redding, owner.

Wilbur Mine (Quartz).—See Harrison Gulch. It lies at 3,100′ elevation. Mrs. Cora Conant, owner.

Yankee Blade Mine (Quartz).—See Bowery Belle.

Yellow Jacket Mine (Quartz).—See our XIIth Report, p. 260. It is 3 miles N.E. of Copley. W. Emerson et al., of Copley, owners.

MILLS IN SHASTA COUNTY.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of Each, in Lbs.	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
					No.	Character.	No.	Capacity.		
American	Water	5	750	-----	-----	-----	-----	-----	-----	-----
Black and Brown Bear	-----	10	850	20	-----	-----	-----	-----	-----	-----
Calumet	Water	24	600	48	-----	-----	-----	-----	-----	-----
Chicago	Steam	5	-----	-----	-----	-----	-----	-----	-----	-----
Celestine	Water	5	850	12½	-----	-----	-----	-----	-----	-----
Clipper and Snider	Steam	10	900	17½	2	Frue	-----	-----	-----	600 sq. ft.
Consolidated Kosciusko	Water	20	850	18–25	4	Frue	-----	-----	-----	367 sq. ft.
Empire	-----	4	850	12	-----	-----	-----	-----	-----	192 sq. ft.
Eureka Tellurium	S. & W.	10	850	15	-----	-----	-----	4 tons.	-----	-----
French Gulch	Steam	10	800	-----	-----	-----	-----	-----	-----	-----
Gem Consolidated	Steam	10	870	20	-----	-----	-----	-----	-----	-----
Gladstone	S. & W.	20	800	46	4	Frue	1	1½ tons.	-----	-----
Green	Steam	5	850	9	1	-----	-----	-----	-----	-----
Iron Mask	Water	5	-----	-----	-----	-----	-----	-----	-----	-----
Lost Confidence	Steam	20	950	40	-----	-----	-----	-----	-----	-----
Majara	Steam	10 8	850 600	27	-----	-----	-----	-----	-----	-----
Niagara	-----	18	750	-----	-----	-----	-----	-----	-----	-----
Reilly & Bliss	Water	10	850	15–20	-----	-----	-----	-----	-----	-----
Summit	Water	5	-----	-----	-----	-----	-----	-----	-----	-----
Sunny Hill*	Water	5	750	-----	-----	-----	-----	-----	-----	-----
Texas Consolidated	Water	20	850	40	8	Triumph	1	2½ tons.	-----	1,313 sq. ft.
Trinity Consolidated	Water	10	850	-----	2	Frue	-----	-----	-----	60 sq. ft.
Uncle Sam	Water	35	850	75	14	Frue & Triumph	-----	-----	-----	1,200 sq. ft.
Washington	-----	10	650	20	-----	-----	-----	-----	-----	576 sq. ft.

In addition to stamps, the mills marked with a * have additional crushing capacity, as noted in the following list:

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN SHASTA COUNTY.

Name of Mill or Mine.	Power.	Number	Character.	Diameter	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
						No.	Character.	No.	Capacity.		
Bullard & Vandever	Steam	1	Huntington	3½′	4						7 sec., 22 ft.
Central	Steam	2	Huntington		23						
Delta	Water		Arrastra	12′	1½			(Car	pet plant	1,152 sq. ft.)	
Edna B.	Steam		Arrastra	8′	4						
Falls Gold	Steam		Tustin Pulverizer		4	1	McGrew	1	1 ton.		
Gray Fox	Steam		Kendall R'ker		6						
Little Maud	Steam		Rotary		6	1	Frue				
Molin	Water		Arrastra	10′	1						
Pugh & Lindsay	Water		Kendall Mill								
Salt Creek	Water		Arrastra		2						
Sunny Hill		1	Huntington	5′							
Three Sisters	Steam	1	Huntington	3½′	5½						180 sq. ft.
Topknot	Water		Arrastra	9′	$\frac{7}{20}$						60 sq. ft.

Sierra County.

Adelaide Mine (Quartz).—It is on Howard Creek, near the base of Haskell's Peak, 9 miles N.E. from Sierra City, at 6,800′ elevation, and comprises three locations. Since our last Report the tunnels have been extended along the contact vein. Two men are at work. An incorporated company, owner; H. H. Bates, of Sierra City, superintendent.

Alaska Mine (Quartz).—See our VIth (Part II) and XIIth Reports, pp. 58 and 261. It is ¼ mile N.E. from Pike City, at 3,800′ elevation, and comprises four claims. Has changed owners and is temporarily idle. An incorporated company, owner.

Alturas Mine (Placer).—See our XIth and XIIth Reports, pp. 332 and 261. It is 3 miles N.E. from La Porte, at 4,000′ elevation, and comprises 5 miles of the Slate Creek channel. Twenty-five men are employed. C. Handel and — Packer, of La Porte, Plumas County, owners.

American Exchange Mine (Quartz).—It is 9 miles N.W. from Sierra City, at 6,400′ elevation, and comprises three locations—two quartz and one placer. One vein, 18″ to 3½′ wide, trends N. 80° E., and the other, 3′ wide, trends N., between porphyritic walls. The developments are made through a 5′x10′ double-compartment shaft, 80′ deep, tapped near the bottom by an adit 300′ in length; a 40′ drift has been run E. from the shaft, and shows a 3′ vein in the breast. A 4-stamp steam-power mill is in course of erection, using a 15 H.P. engine. Water-power for the mill might be used four to five months in the year. Three men are employed. G. Morrison, of Sierra City, owner.

Atom Mine (Quartz).—See our XIIth Report, p. 261.

Bald Mountain Extension Mine (Drift).—See our VIIIth, XIth, and XIIth Reports, pp. 580, 408, and 261. It is 2½ miles E. of Forest City, at 4,300′ elevation, and comprises 1,600 acres. Since our last Report the work has been progressing down the channel toward Forest City. The gasoline-engine at the head of the incline hitherto used for hoisting and pumping has been replaced by a 10 H.P. electric motor, actuated by a 17 H.P. dynamo on the outside. This motor hoists and pumps from 175′ on the slope or 60′ perpendicularly, using a 5″ Challenge pump with 3″ discharge pipe. Fifteen incandescent lights of 16 candle-power, 5 on a circuit, are supplied underground, and 20 on the outside. The main wire is ⅜″ rubber insulated, 2½ miles long, while ¼″ wire is used for the branch connections. The dynamo is run by an 18 H.P. steam-engine. Since 1894 about 1,000′ of the channel has been worked. It is said the average in September, 1895, was $6 per carload of 2,500 lbs. Forty men are employed. An incorporated company, of Downieville, owner; J. A. McDougall, of Forest City, superintendent.

Bigelow Mine (Quartz).—See our XIth and XIIth Reports, pp. 413 and 262. It is ¼ mile N.W. of Sierra City, at 4,400′ elevation. It is on an extension of one of the Sierra Buttes veins. Idle. Mrs. Bigelow, of Sierra City, owner.

Bonanza (Mountain) Mine (Quartz).—It is on the Sierra Butte, 3 miles N.E. from Sierra City, at 7,500′ elevation, and comprises two claims, besides some placer ground. The vein, varying from 8″ to 8′ in width, trends N.W. and S.E., and dips 45° E., between greenstone and slate walls. It is developed by three tunnels, the two upper ones passing entirely through the ridge; the uppermost, or No. 1, is 800′; No. 2, 1,600′, and No. 3, 1,200′ long, and No. 1 is 200′ below the croppings and 125′ above No. 2, which is 200′ above No. 3. All three tunnels are connected by upraises. The ore is conveyed to the 40-stamp water-power mill near the Yuba River by a wire-rope gravity tramway, 6,000′ long, carrying buckets of 400 lbs. capacity; 125 tons per day can be delivered to the mill. The stamps weigh 850 lbs. and crush 1¾ to 2 tons each per day through a No. 50 burr punched screen. The mill is run by a 4′ Pelton wheel, with water obtained from Sardine Creek and the Yuba River, through ¾ mile of ditch and flume, and delivered under 235′ head. The expense for mining, tramming, and milling averages $2 per ton. Fifty-five men are employed; temporarily closed by litigation. An incorporated company, owner; A. G. Smith, manager.

Brandy City Mining Co.'s Mine (Hydraulic).—See our XIIth Report, p. 262. It is in Brandy City, at 3,700′ elevation. Since 1894 the ditches, flumes, and restraining dams have been restored, and washing has commenced; the season lasts three to four months. The 1,000 inches of water from Sailor's Ravine and Cherokee Creek is brought through a 4-mile ditch, 4′ on top, 3′ on bottom, and delivered under 150′ pressure. The depth to bedrock is 238′, but cannot be reached because of lack of grade. The mile-long tail-flume passes through a 300′ tunnel with about 18′ of dump. A brush dam, 400′ long, 40′ wide on bottom and 14′ high, holds the debris in the worked-out pit. Fifteen men are employed in the season. Allenberg & Goldstein, of San Francisco, owners; J. Redington, of Brandy City, superintendent.

Bruckerman Mine (Drift and Placer).—It is in Studhorse Cañon, ¾ mile N.W. from Poker Flat, at 5,500′ elevation, and comprises 85 acres. The channel courses N.E. and S.W. There are open cuts in the gravel, worked by ground-sluice, and a 200′ tunnel in bedrock, partially exposing the gravel. Snow-water alone is available. Two men are at work. F. Bruckerman, of Poker Flat, owner.

Bullion and El Dorado (*Fessler*) *Mine* (Quartz).—See our XIth and XIIth Reports, pp. 407 and 262. It is on Kanaka Creek at the mouth of Steamboat Ravine, and 1½ miles S. from Alleghany, at 4,450′ elevation, and consists of the *Bullion* 1,000′x 400′, the *El Dorado* 1,400′x 600′, and extensions on both, as well as a fractional claim. Two parallel veins, the Bullion and El Dorado, are 400′ apart, trend S. 80° E., and dip 45° to 60° N.E., between slate walls; the former averaging 5′ and the latter 2½′ in width. There are serpentine belts on both sides of the slate belt, and the veins show the marked presence of mariposite, which is taken as a favorable indication of mineralization of the veins for this district. Other quartz croppings show on the surface between the two ledges, which are, however, probably breakages from the Bullion outcrop. The two main veins appear on the surface to unite both E. and W. The El Dorado carries a milk-white quartz, with arsenical pyrites scattered singly through it next to the hanging-wall. At frequent intervals pockets of gold have been met, enabling the owners to make a profit by hand-mortaring the quartz. The Bullion vein carries a more glassy quartz, of a crystalline texture, carrying copper sulphide along the foot-wall side of the vein. Both veins evidence considerable movement by striation marks and the shattering of the quartz in the vein, as well as polished quartz surface. On the Bullion is a 100′ tunnel, with a small stope, at 4,265′ elevation; 80′ below is a second tunnel. The workings at present are confined to the El Dorado, on which are two main tunnels along the vein, 360′ and 320′ in length, connected by a gravity incline tramway, 600′ long from the lower one to the mill. The ground between the two tunnels is nearly untouched, but is furnishing part of the present supply of milling ore, the rest coming from the large stope above No. 1. A new 10-stamp water-power mill, crushing 14 tons daily, is situated on the bank of the South Fork of Kanaka Creek, and has 750-lb. stamps, 12′ of apron-plates, and two Johnston concentrators; the latter are not in use. Water, 200 inches, is brought from the creek through 4,000′ of ditch and flume, mostly the latter, 14″x 18″, and set on ½″ to 12′ grade. The water is delivered to a 4′ Pelton wheel under 120′ pressure. Ten men are employed. Mrs. Fessler, the Fessler heirs, and Mr. Lewis, of Alleghany, owners.

Bull of the Woods Mine (Quartz).—It is 11 miles N. from Sierra City, at 7,100′ elevation, and comprises two claims on a contact trending N.W. The workings have failed to develop any more than a mass of clay and quartz mixed, without any definite walls. There is a 4′ Huntington mill, using steam-power. Idle. Four men are prospecting. M. B. Sheaver, of San Francisco, and — Knickren, of Mohawk, Plumas County, owners.

Bunker Hill Mine (Drift).—See our XIIth Report, p. 263. It is situated 4 miles N.E. from Gibsonville, at about 4,450′ elevation. D. Conlan and W. Metcalf, of Nelson Point, Plumas County, owners.

Butcher Ranch Mine (Quartz).—It is 10 miles N. of Sierra City, at 6,500′ elevation. The 6′ vein trends N. and S., between slate and porphyry. A 12-stamp water-power mill is ½ mile distant. Idle. J. Van Slyte, of Downieville, owner.

Buttes Saddle Quartz Co.'s Mines (Quartz).—They are situated near the crest of the Sierra Buttes Ridge, 2 miles from Sierra City, at 8,000′ elevation, and comprise two full claims. The vein courses E. and W., and dips about 50° N., between porphyritic walls, with a gouge on the foot-wall. The vein is 4′ to 5′ wide and carries high-grade sulphurets. A 1,200′ tunnel, run on the vein, gives at the breast 250′ of backs; there is an upper tunnel 200′ in length. A 75′ shaft has been sunk below the main tunnel. The ore is carried to the mill in buckets of 400 lbs. capacity on a 6,000′ gravity wire tramway of two sections, the transfer station being about midway. Considerable stoping has been done. The 10-stamp water-power mill, with 750-lb. stamps dropping 80 times per minute, with 6½″ drop and 7″ discharge through No. 8 slot-cut screens, crushes 13 tons per day; the tailings are saved for future working. The water, 18 miner's inches, is bought by monthly contract from the Sierra Buttes flume, and delivered to a 4′ Pelton wheel, under 200′ pressure, through 400′ of 6″ pipe. Twenty men are employed. S. Miller, of Sierra City, superintendent.

California Gold Production Syndicate's (*Ltd.*) (*St. Charles Hill*) *Mine* (Drift and Quartz).—It is in T. 20 N., R. 9 E., between Goodyear's Bar on the east and Fiddle Creek on the west, at 2,000′ elevation above the Yuba River and 4,900′ above sea-level. The property has been developed through an incline shaft, 117′ deep, and a tunnel; the shaft will require to be extended 110′ on 60° pitch to reach bedrock. The tunnel, which is 1,000′ long, had reached the rim-rock, but is partially caved. The rims are 2,000′ apart on the surface; 700′ of the channel passes through the company's ground. A 30 H.P. engine runs the hoist and pump; the latter has a 9″ discharge pipe. There are two quartz claims on the property, designated the *Cleveland* and *Kentuck*, which trend N.W.; the Cleveland dips 20°, while the Kentuck dips more N.E. There are two ditches taking water out of Fiddle Creek, each with a capacity of 200 miner's inches, and about 1¼ miles long. Fourteen men are usually employed, though the property is temporarily idle.

Cedar Gold Mine (Quartz).—See our XIIth Report, p. 263. It is on Kanaka Creek. J. Fessler, of Alleghany, owner.

Chinese Mine (Placer).—It is on a bar of the Yuba River, near Charcoal Flat, between Sierra City and Downieville. The pit is 30′ deep, and requires the use of a hand derrick and one Chinese pump. Ten Chinese are working. A Chinese company, owner.

Chips Mine (Quartz).—See our Xth and XIth Reports, pp. 652 and 402. It is 1½ miles E. of Sierra City, at 4,675′ elevation. At present only prospect work is being done, driving the main drift ahead. Six men are at work. J. Sullivan, of Sierra City, superintendent.

Cleveland Mine (Quartz).—See our Xth and XIth Reports pp. 650, and 414. It is 5 miles S.W. of Sierra City, at 4,550′ elevation, and comprises three claims. The main tunnel has been extended to 1,800′ long, following the seams of quartz in the slate bedrock, which trend N.W. and swell occasionally to bodies of quartz several feet thick, and carrying in part rich ochery seams. The 12-stamp water-power mill runs during the day only. Eight men are employed. B. Tomola, of Sierra City, manager.

Clipper Ship Mine (Drift).—See our XIIth Report, p. 263. It is about 1½ miles S.E. of St. Louis. D. Conlon, owner.

Colombo Mine (Quartz).—See our Xth Report, p. 648. Idle. It is 3½ miles S.W. of Sierra City, at 5,150′ elevation. J. A. Roebling Sons, of Trenton, N. J., owners.

Craycroft Mine (Hydraulic).—See our XIIth Report, p. 263. It is on Alabama Hill, 8 miles by trail from Downieville, at about 6,000′ elevation. During the last two years 500′ of the channel has been worked. The present pit is 60′ deep by 150′ wide, all gravel. The tail-flume is 600′ long, and the tailings are restrained by a cribbed dam 200′ wide and 30′ high. The 600 inches of water are supplied (in part) from the Hearst & Haggin ditch, 8 miles long, 2½′ wide on bottom, and 1½′ deep taken from east branch of the Middle Fork of the Yuba River; also from 4 miles of snow-water ditches heading in Rattlesnake Gulch. The water season is three and a half months. The water is delivered through two lines of 15″ to 11″ pipe, ½ mile long, and under 70′ pressure. Ten men are employed. H. Spaulding, J. M. George, and N. Scammon's estate, of Downieville, owners.

Crown Point Mine (Drift and Hydraulic).—It is 11 miles E. of Gibsonville, at 5,575′ elevation, and comprises 115 acres. Last year the ground was worked by the hydraulic system, the water being obtained from Porter's and P. Lawler ravines through a ditch 1 mile long, 6′ on top, 4′ on bottom, with 1½″ grade to the rod, and carrying 1,000 miner's inches, delivered, under 168′ pressure, to a No. 3 giant with 5″ nozzle, through 580′ of pipe, reducing from 15″ to 11″. The bank is from 12′ to 20′ high, with from 6′ to 7′ of gravel. The tail-flume has 4′ bottoms, is rock paved, and set on a 12″ grade to the box. A space 80′x 180′ has been piped off. The water season lasts four to five months. The dump is through Porter's Ravine to Nelson Creek, where there is a restraining dam (poles and brush) 120′ across and 15′ high; a cribbed dam, ¼ mile below, for the dead water, is 100′ across and 20′ high, and will be raised 8′ higher; the cribbing is filled with stone and brush. In the drifting portion of the mine a 35′ shaft has been sunk. Six men are employed. Sinnott, Carmichael, et al., of Gibsonville, owners.

Depot Hill Mine (Hydraulic).—See our XIIth Report, p. 264. It is 5 miles N. from Camptonville, and comprises 60 acres. Since our last Report the mine has been enjoined; at present a cut is being made to enable the working of the mine with restraining dams. Four men are at work. F. Joubert and partner, of Camptonville, Yuba County, owners.

Docile Mine (Quartz).—See our XIIth Report, p. 264. It is on South Fork of Kanaka Creek, 3½ miles E. from Alleghany, at 4,050′ elevation. The vein trends along the slate and serpentine contact. An upraise is being made to connect the tunnels. The mine is pockety, and is being worked by two lessees. F. Smith, of San Francisco, et al., owners.

Dreadnaught Mine (Quartz).—See our XIIth Report, p. 264. It is 2 miles N. of Alleghany. Idle. S. S. Crafts & Son, of Alleghany, owners.

Eclipse Mine (Quartz).—It is 1 mile S. of Alleghany, at 4,000′ elevation. The vein trends nearly E. and W., dips about 45° N., in the serpentine belt adjoining the slate, and varies from a seam to 6′ in width, carrying pockets of coarse gold. The ore, carrying arsenical pyrites, is worked with a small furnace and a hand-mortar. Three tunnels have been run; two from the south are 220′ and 130′ long, and one from the north is 50′ long. Two men are at work. Appel & Grant, of Alleghany, owners.

El Dorado Mine (Quartz).—See Bullion and El Dorado.

Empire Mine (Quartz).—See Gold Valley.

Eureka Mining Co.'s Mine (Hydraulic).—It is situated 8 miles N. from Downieville, at 4,800′ elevation, and comprises 20 acres on an ancient channel. The bank is 60′ to 90′ high, 30′ of which is a pipe-clay capping and about 200′ across. The bowlders are blasted. The outlet is through 1,500′ of tunnel into Little Cañon Creek, furnished with a 3′ flume paved with rocks. Two miles below the dump is a restraining dam of cribbed logs, 25′ high and 200′ long. An area of 200′x 150′ has been worked during the 3½ to 4 months' water season. Water is obtained partly from snow and partly through the Eureka ditch, which is 5 miles long and has a capacity of 2,000 miner's inches; it is delivered to two giants, using 4″ and 6″ nozzles, under 70′ pressure, through a double line of 15″ pipe, 1,000′ long. A clean-up is made once a season. Twelve men are employed. Spaulding & Mowry Bros., of Downieville, owners.

Excelsior Mining Co.'s Mine (Hydraulic).—It is 4 miles N. of Downieville, at 4,950′ elevation, and comprises 300 acres on an ancient channel, 800′ across and capped with 25′ of pipe-clay. The bank is 75′ deep in the lowest place and carries large bowlders next to the bedrock; the gravel is picking ground, and contains fine gold throughout. The dump is through 500′ of a bedrock cut into Eagle Ravine, and from there to Smith's Flat, where there is a brush restraining dam, 25′ high at the highest part, and 500′ across. The 30″ tail-flume is 600′ long, and rock paved. An area of 300′x 200′ of the channel has been worked. Water is obtained from Wood's Spring, through 2 miles of ditch, with 2′ bottom, 1½′ deep, and 1″ grade per rod, and is delivered to two giants, using

3″ and 4″ nozzles, under 170′ pressure, through 800′ of 11″ pipe. Eight men are employed. G. Costar and — Sardine, of Downieville, owners.

Excelsior Mine (Drift).—See our XIIth Report, p. 265. It is 1½ miles S.E. of St. Louis. Idle. W. N. Bissett, of St. Louis, superintendent.

Feather Fork (*Thistle Shaft*) *Gold Gravel Co.'s Mine* (Drift).—See our XIth and XIIth Reports, pp. 330–419 and 265. It is 2 miles S.W. from Gibsonville, at 5,700′ elevation. In October, 1895, the main gangway had been extended 1,500′ up the channel and the main breasting was along the east rim, where in places the breasts had been carried 9′ high. In running a preliminary gangway down the channel along the east rim, it appeared that a pay streak follows the east rim past the shaft, which can be worked by a short drift due east from the shaft. The gold found on the east rim is not as coarse in character as that obtained on the west rim, but appears to be more plentiful. The main gangway has been provided with three rails and given sufficient grade to enable the downward, or full, car to bring up the empty one. The company has erected a large new boarding-house, and a covered dump-house of 10,000 to 15,000 tons capacity. The reservoir for washing has 30,000 gallons capacity. Seventy men are employed. W. C. Wingate, of Gibsonville, manager.

Garibaldi Mine (Quartz).—It is situated in Gold Valley, at 7,000′ approximate elevation. Provided with a 10-stamp mill. Idle.

Gibsonville Water and Nevada Mining Co.'s Mine (Hydraulic).—See our XIIth Report, p. 266. It is ¾ mile N.E. of Gibonsonville, on Slate Creek. Idle. G. W. Cox, of Table Rock, agent.

Glidden (*Gold Lake*) *Mine* (Quartz).—See our XIIth Report, p. 266. It is in Gold Valley, 1½ miles N.E. of the Empire Mine. Closed by litigation.

Gold Bluff Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 579 and 266. It is 2 miles N.E. of Downieville, at 3,200′ elevation, and comprises four claims. The main vein, 5′ wide, courses N. 20° W., and dips about 55° E.; another, designated "the E. and W. vein," intersects the larger one. The country rock is slate and porphyry. The mine is worked through a cross-cut adit 1,600′ long, tapping the vein 700′ below the croppings, and from which a 200′ incline has been sunk, showing a well-mineralized vein 8′ thick. This incline has been connected with the surface by a 540′ perpendicular shaft. Two upper tunnels have been run, cutting two ore-shoots pitching east; considerable stoping has been done on a shoot 125′ long. In the shaft, at the main tunnel level, is an electric hoist, and pump with 2″ discharge pipe. The main tunnel and stations are supplied with electric lights. The outside plant consists of a 20-stamp water-power mill, with four Johnston concentrators, and all needed machinery for speedy and economical handling of the ores, except a chlorination plant. Four separate water-wheels (Pelton and Dodd) are used. A 124 H.P. dynamo, driven by a 5′ Pelton wheel, runs a 30 H.P. motor for hoisting, a 15 H.P. motor for pumping, and a 5 H.P. motor for the blower, besides 60 incandescent lights of 32 candle-power. The water-power is derived from the North Fork of North Yuba River, through 2½ miles of ditch, 2½′ wide on bottom, with 1″ grade per rod, and carrying 300 miner's inches, delivered under 270′ pressure through 600′ of 16″ pipe. Temporarily idle. G. Costar, of Downieville, owner.

Gold Valley (*Empire*) *Mine* (Quartz).—See our XIIth Report, p. 265. It is in Secs. 25 and 26, T. 21 N., R. 11 E., in Gold Valley, 13 miles

N.E. of Downieville, at over 7,000′ elevation, and comprises two locations, designated the *Empire* and *Minerva*. The vein courses N. 65° E., and dips 50° S.E., between walls of igneous rock with good clay gouge. Portions of the vein carry as much as 10% low-grade sulphurets. Since our last Report the mine has changed ownership, and additions have been made to the plant with reference to the long and severe winters of that section. A 25-stamp mill, run by electric power, has been placed at the mouth of the main tunnel, and adjoining it, below, a chlorination plant of a capacity of 4 tons per day; also an assay and melting department. The mill is supplied with seven concentrators—Johnston, Frue, and Triumph. The reverberatory furnace has a one-step hearth; it is 70′ long, 13′ wide in the clear, and consumes ⅞ cord of wood in 24 hours. There are 4 chlorinating vats of 2½ tons capacity; 2 precipitating vats, 1 settler, and several tanks for saving copper; no attempt is made to save the silver. The entire works are lighted by electricity, there being 80 incandescent lights of 32 candle-power; a 60 H.P. motor runs the mill and a 60 H.P. motor runs the hoist and compressor. The Rand compressor drives 1 Rand and 2 Eclipse machine drills. The dynamo is ¾ mile from the works, and is driven by a 4′ Pelton wheel, under 350′ head, with water diverted through two branches of the Yuba River. It is said that 25% loss occurs in transmission. Three telephone lines connect the different parts of the works with one another, and also with Downieville. In the mine, the new company has extended the incline shaft 200′ below the main tunnel, opened stations on the 100′ and 200′ levels, and drifted on the sulphuret shoot, stoping from the 100′ level to the main tunnel level. Fifty men are employed. Capt. Buckley, of Downieville, manager.

Golden King Mine (Quartz).—See our XIth and XIIth Reports, pp. 417 and 266. It is on the South Fork of Kanaka Creek, 3 miles E. from Alleghany, at 4,025′ elevation, and consists of the *Gold King*, *Gold Queen*, *Vesuvius*, and *Victor* claims. The *Gold King* and the *Gold Queen* veins vary in width up to 10′, trend N.E. and S.W., and dip 40° to 70° W., between black slate walls. Where mariposite is found in the vein, it is taken as an indication of good ore. The *Vesuvius* vein trends N.W. and S.E., dips 50° S.W., and varies from a seam to 18″ in width. The *Victor*, on the opposite side of the creek, is undeveloped. The present developments consist of a shaft and two tunnels. No. 2 tunnel extends 596′ on the north side of the creek and 236′ on the south side; this portion is abandoned. The perpendicular shaft intersects No. 2 tunnel and continues to No. 3 level, at which point there is a 35′ cross-cut to the vein, thence a drift 374′ N. and 336′ S. No. 4 level is 89′ below No. 3, and, as it would require a very long cross-cut to reach the vein, the portion of the shaft from No. 2 down is being changed to an incline on a uniform slope. The vein in the lower level, as well as in the incline beneath, looks well. Northeast of the shaft is practically virgin ground, while southwest of the shaft, in working around a horse on the foot-wall side, an 8′ vein of a good milling grade of ore has been cut. The mine makes about 240 gals. of water per hour. A pump has replaced the former method of bailing. The steam-power used for the 10-stamp mill is to be changed for water, but the machinery of the former will be retained to use in a case of emergency. The water-power is derived from a 5′ Pelton wheel, under 175′ head, from a flume 2,700′ long, diverted by a rock dam across Kanaka Creek below the junction of the South and

Middle forks. Twenty men are employed. W. J. Adams, of Alleghany, manager.

Golden Star Mine (Quartz).—It is on the South Fork of the Yuba River, 1½ miles E. of Downieville, at 3,525′ elevation, and comprises three claims. There are two veins; a large one, 6′ to 8′ wide, coursing W. of N. and dipping W., and a smaller, blanket ledge, 6″ to 18″ wide, in slate and porphyry, and making into the other. A 150′ tunnel has been started to cut this smaller pocket vein, and is now 70′ long. Two men are at work. C. M. Wilson, of Downieville, manager.

Hanley & Co.'s Mine (Drift).—See our XIIth Reports, p. 267. It is in French Ravine, 3 miles S.W. from Alleghany, at 4,300′ elevation, and comprises 140 acres. Since our last Report the work has been extended up the channel. Eleven Chinese are at work. Mrs. Hanley & Son, of Alleghany, owners.

Hawkeye and Bell Point Consolidated Gravel Mine (Drift).—See our XIIth Report, p. 267. It is 5 miles N.E. from Minnesota, at about 5,000′ elevation. Twelve men are at work. M. Mehan et al., of Minnesota, owners.

Holloway Mine (Hydraulic).—It is on the east branch of Hopkins Creek, 8 miles N.E. from Gibsonville, at about 5,000′ elevation, and comprises 60 acres. The pit bank is 250′ wide and 25′ high, carrying 8′ of blue lava gravel next the bedrock; a few feet above it is an 8′ deposit of reddish gravel; both are gold-bearing, but of different character. The bank is shaken up with powder drifts, and the bowlders are all blasted; the bedrock is a hard, blocky slate. The 40″ tail-flume has 12″ grade to the box; is 120′ long, and dumps into the East Fork of Hopkins Creek, where two restraining dams have been built; one a log dam, 133′ long, 8′ high; below, 2,000′, is one of rock, 23′ high and 104′ long. Water is diverted from the west branch of East Fork of Hopkins Creek, through 1¼ miles of ditch of 1,000 inches capacity, during the season of 100 days, and is delivered, under 350′ pressure, through 1,200′ of 15″ to 9″ pipe, to a No. 2 giant. Two men are employed. Spencer & Gould, of Gibsonville, owners.

Homestake Mine (Hydraulic).—It is 10 miles N.E. from Sierra City, at 6,200′ elevation. The gravel, in the nature of a ravine wash, carries coarse gold, is 10′ deep and is worked 50′ wide, through 150′ of tail-flume, 16″ wide, set on an 8″ grade and paved with wooden blocks. The requisite water is obtained from Church Creek, through 2 miles of ditch of 100 inches capacity, and is delivered, under 75′ pressure, through 300′ of 7″ pipe. The water season lasts 90 days. Four men are employed. Atkinson Bros. and C. Wichman, of Sierra City, owners.

Hughes & Westfall Mine (Hydraulic).—It is 9 miles N. from Sierra City, at 6,650′ elevation, and comprises ten claims along the bed and bars of Howard Creek, including the former *Hayes & Steelman* Mine. The gravel is worked with two No. 3 giants in a cut, 150′ wide by 12′ deep; in places the gravel is cemented, and one acre was removed during the past season. The gold is found on a false or cement bedrock; it is coarse and quartzy. Two water-power derricks, with 80′ masts and booms, are worked by a 6′ and a 7′ hurdy wheel, and place the bowlders outside the cut. The gravel is washed through 200′ of 40″ tail-flume, set on 5″ and 4½″ grade to the box, paved with blocks; it is dumped into the creek below, where it is restrained by a cribbed log and brush dam, 33′ high and 200′ long. The water is brought from Howard Creek, through 150 rods of ditch and 1,600′ of 15″ pipe, delivering 300 miner's inches under 120′ pressure. The water season lasts 100 days. Twenty men are employed. W. Hughes and E. J. Westfall, of Sierra City, owners.

Jackson's Mine (Placer).—See our XIIth Report, p. 268. It is on the south side of the North Yuba River, 9 miles N.W. from Camptonville, at 2,450′ elevation. The location comprises one claim on the bank and a tailings claim in One Horse Ravine. E. T. Jackson, of Camptonville, owner.

Kanaka Mine (Quartz).—See our XIth Report, p. 404. It is midway between Sierraville and Downieville. Idle. L. Voss, of Downieville, owner.

Keystone Mine (Quartz).—See our Xth and XIth Reports, pp. 653 and 403. It is in Sec. 32, T. 20 N., R. 12 E., at 6,100′ elevation. Idle.

Last Chance Mine (Hydraulic).—It is 7 miles N. of Sierra City, at 6,000′ elevation. It is a claim along the bed and bars of Howard Creek. The gravel is 15′ deep and is worked 100′ wide, using 300′ of 30″ tail-flume, set on a 5″ grade and paved with 8″ wooden blocks. A ½ mile ditch from Howard Creek delivers 300 miner's inches of water under 100′ pressure, through 500′ of 11″ pipe, to the giant and derrick. The water season lasts four months. Five men are employed. F. Cadoce et al., of Sierra City, owners.

Lone Star Consolidated Gold Mining Co.'s Mine (Quartz).—See our XIth and XIIth Reports, pp. 405 and 268. It is 14 miles N.E. of Downieville, at 6,750′ elevation. Idle. J. Weisbein, of Grass Valley, Nevada County, secretary.

Lucky Dog Mine (Drift).—See our XIIth Report, p. 268. It is 1½ miles W. of Forest City. Idle. J. Smith, of Forest City, superintendent.

Mammoth Springs Mine (Drift).—See our XIIth Report, p. 268. It is on a branch of Kanaka Creek, at 4,300′ elevation, and comprises 500 acres. Since our last Report the company has started to run for the channel, which trends N.E. toward the City of Six, and has cleaned out and retimbered some of the old works and made an upraise. Five men are employed. D. Dever, of Forest City, manager.

Mariposa Mine (Quartz).—It is 1 mile S. from Alleghany, at 4,000′ elevation, and comprises two claims. The 18″ vein trends slightly N. of W., and dips 45° E., between metamorphic slate and serpentine walls. Three tunnels, 430′, 340′, and 295′ long, have been driven. It is 41′ between No. 1 and No. 2, and 31′ between No. 2 and No. 3, on the dip of the vein; all are connected by winzes and upraises. Two hundred feet in from the mouth of the lower tunnel a 150′ shaft has been sunk and a steam hoist placed thereon. The ore has been hand-mortared. Ten men are employed. H. Appel and — Grant, of Alleghany, owners.

Minnesota Development Gold and Silver Mining Co.'s (Hope) Mine (Quartz).—It is in Steamboat Ravine, 1½ miles S.E. from Alleghany, at 4,325′ elevation, and comprises 4,000′ by 500′. There are several parallel veins trending slightly N. of W. and dipping N., following the intrusions and depressions of the serpentine which forms the foot-wall. Slate forms the hanging-wall, and, for some of the quartz croppings, both walls. The veins swell and contract, varying from 2′ to 10′ in width, and carry on both sides a gouge, in part of a graphitic clay and with occasional talc slate casings. Mariposite, locally designated "Blue Jay," is also of frequent occurrence. Years ago the southeast end of the claim was opened by a 200′ cross-cut to the vein, where a 50′ winze was sunk and a drift run on the 3′ to 5′ wide vein, yielding largely. The further prosecution of the work was hindered by the heavy flow of water; about 6 miner's inches still flow from the tunnel. The recent developments consist of a 142′ tunnel at the north end of the claim on Steamboat Ravine; it forks, one branch following the course of the serpentine footwall, while the other cross-cuts the general trend of the vein. Crossing the course of the veins above the Hope tunnel is a gravel channel that is being worked by the Snowden or Steamboat Drift Company; it carries a large percentage of auriferous quartz bowlders, with sharp edges. The difference in elevation between the old tunnel and the present one is about 285′. A mill site below the new tunnel permits of the company taking water from the McNulty ditch above, under 435′ pressure. This ditch is 4 miles long, 5′ on top, 2½′ wide on bottom, and takes 600 miner's inches of water from Kanaka Creek. Eight men are employed. J. O. Jones, of Forest City, superintendent.

Mountaineer Mine (Quartz).—It is on the Sierra Buttes, 9 miles N. from Sierra City, at 6,100′ elevation, and comprises six claims, designated *Lake*, *Mountaineer*, and *Tunnel Ledge No. 2*, with three parallel claims. The vein in the Lake is 5′ wide, and trends E. and W. between the contact of quartzite and porphyry, while the other two trend N.W., and dip 35° to 45° N., in porphyry. The Mountaineer is 8′ wide; the Tunnel No. 2 vein is 6′ to 8′ wide. The developments consist of an upper tunnel, 350′ long, cross-cutting to and 200′ beyond the Lake vein. An east drift on the Lake vein at this level is 450′ long, and passes 140′ through a pay-shoot. On the west end of this vein, 260′ below the upper level, is a tunnel, 1,400′ long, cutting the longest west shoot. The vein is blind, only exposed through several shallow shafts. A tunnel, 422′ long, cuts Tunnel Ledge No. 2, and is being continued to cut the Lake vein, which makes considerable water. The 10-stamp mill, framed for 20 stamps, is run by water taken from Deer Lake through 6 miles of ditch, 4′ wide on top and 3′ on bottom, with 200 miner's inches capacity, delivered under 80′ pressure to a 5′ Knight wheel. When required this pressure can be greatly increased. The property includes three sections of timber land, the whole at present being worked under a bond. Ten men are employed. C. Berger, of Sierra City, owner.

Mount Fillmore Consolidated Mine (Quartz).—See our XIIth Report, p. 269. It is on the south side of Mount Fillmore, 6 miles from Gibsonville. Assessment work only. C. B. Wright et al., of Gibsonville, owners.

Mount Moriah (*Lawler*) *Mine* (Quartz).—See our XIIth Report, p. 269. It is on Little Wolf Creek, 7 miles N.E. of Minnesota, at 5,000′ altitude. Idle. D. R. McIntosh et al., of San Francisco, owners.

North Fork Co.'s Mine (Drift).—It is ¼ mile N.W. from Forest City, at 4,900′ elevation, and comprises 1,200 acres of ground. The present workings are through a tunnel 1,700′ long, which starts in gravel and reaches bedrock in 1,100′, where swelling is encountered. The "white quartz channel" to be cut courses W. of N., and has a 2% grade. It takes the continuous work of four men to maintain the grade of the tunnel and relieve the timbers, which are 3′ 8″ caps and 7′ posts, with 11′ spread. The ventilation is through a water-blast. Eleven men are employed. J. A. Jones, of Forest City, manager.

Oxford Mine (Quartz).—See our XIIth Report, p. 269. It is 1 mile N.E. of Downieville, at 3,400′ elevation at the mouth of the tunnel. Idle. H. Purdy et al., of Downieville, owners.

Pacific and Alta Mine (Quartz).—It is 1 mile N. from St. Louis, at 5,000′ elevation, and comprises two claims. The vein courses N.E. and dips S.E.; the country rock is slate; the fissure is 16′ between walls, with 8′ of quartz and graphitic gouge on foot-wall. The developments consist of an 18′ incline, 4′x 8′ open cut, and an 8′ shaft. The main vein is thrown 40′ by a cross-vein, 4′ wide. The quartz is glassy, and carries a few sulphurets; the surface would pay well to hydraulic, thereby uncovering the outcrop of the vein. Assessment work only. D. Conlan, of St. Louis, owner.

Phœnix Mine (Quartz).—See our Xth and XIth Reports, pp. 653 and 402. It is on the south side of the Sierra Buttes, 1 mile N.E. from Sierra City, at 4,800′ elevation. Since our last Report the shaft has been sunk deeper. Idle. W. Bush, of Downieville, owner.

Pioneer Mine (Drift).—See our XIth and XIIth Reports, pp. 412 and 270. It is 1½ miles N. of Port Wine, and comprises 360 acres. The ground is supposed to be on the Port Wine channel, which has a N.W. course and 4″ grade per rod, and is opened with tunnel and incline. The tunnel is 1,600′ in length, reaching the channel in 1,325′. The incline is 35′ on a 25° slope. A 12 H.P. gasoline hoist is used. The gravel is mostly quartz, carrying fine gold, and is capped in part with lava and pipe-clay; the entire depth is 230′, of which 120′ is gravel. The breasts are carried 3½′ to 4′ high, and 30′ to 35′ wide, timbered with post and cap. The gravel has to be blasted, a breaster averaging about 2 cu. yds. per shift. The cars contain 19½ cu. ft. A centrifugal pump, run by an 8 H.P. engine, raises 15,000 gals. of water per hour for ten hours. There are 2,200′ of 16″ tail-flume set on a 6″ grade. Thirty-five men are employed. J. F. Carter, of San Francisco, owner; G. S. Deisen, of Port Wine, manager.

Plumbago Mine (Quartz).—See our XIIth Report, p. 270. It is on the Minnesota side of the ridge, 2½ miles S. of Alleghany, at 4,375′ elevation. Since our last Report, a new 10-stamp mill has been put in running order, to be driven by a 30 H.P. steam-engine; it is supplied with four Frue vanners. The two principal tunnels have been connected by an upraise. Twenty men are employed. The mine has recently changed owners.

Rainbow Mine (Quartz).—See our XIIth Report, p. 270. It is on Kanaka Creek, ½ mile S. from Alleghany, at 4,000′ elevation, and comprises six claims. The main vein courses E. and W., and dips 45° N., between greenstone and serpentine walls, with a good clay selvage and a partial casing. The vein was first uncovered in the Union Co.'s drift tunnel; later it was tapped in the Hanley tunnel 40′ below, and then 60′ lower in the Groves tunnel, where a station was cut and a 4′x 8′ double-compartment shaft sunk to 307′ in depth, and provided with a steam hoist. From this point upward all the stoping was done. The total length of the Groves tunnel is 1,914′. A lower tunnel, started near the creek, extends with its branches 2,300′, and an upraise from it connects with the upper works 481′ above. No permanent pay-rock has been struck in the lower works. The 10-stamp mill is run by a 5′ Pelton wheel with 300 inches of water from Kanaka Creek, through 3,000′ of 28″x 14″ flume on ¼″ grade. The mill has not run for several years. Two men are prospecting the mine. J. O. Groves, of Alleghany, manager.

Reece Ravine Diggings (Placer).—See our XIIth Report, p. 270. It is 3 miles S. of Poker Flat, at 5,000′ elevation. Idle. J. R. Alexander, of Table Rock, owner.

Riffle Mine (Drift).—See our XIIth Report, p. 270. It is in Grass Valley, 2 miles S. of St. Louis. Idle. W. Prosser, of Port Wine, superintendent.

Rising Sun Mine (Quartz).—See our XIth Report, p. 418. It is 1½ miles E. from Alleghany, at 4,430′ elevation. The vein trends N.E. and S.W. and dips 70° N.W. It is opened by tunnels, which are connected by wire-rope tramway with a 10-stamp mill with two vanners. In October, 1895, the property was in the Sheriff's hands.

Rocky Peak Mining Co.'s Mine (Drift).—See our XIIth Report, p. 271. It is on the Brandy City and Eureka ridge, 4 miles N.E. of Brandy City, at 2,015′ elevation. J. Arnott, of Camptonville, superintendent.

Ruby Gravel Mining Co.'s Mine (Drift).—See our XIth and XIIth Reports, pp. 406 and 271. The channel is worked out.

Russell Hill Mine (Drift).—See our XIIth Report, p. 272. It is on Depot Hill, 5 miles N. of Camptonville. W. S. Russell et al., of Camptonville, owners.

Sailor Boy Diggings (Hydraulic).—See our XIIth Report, p. 272. It is near Brandy City, at 3,475′ elevation. M. Carter, of Camptonville, lessee.

Scotia and Alice Consolidated Mine (Quartz).—See our XIIth Report, p. 272. It is 3 miles S. of Forest City. Idle. W. H. Smith, of Alleghany, owner.

Sierra Buttes Mine (Quartz).—See our VIth (Part II), VIIIth, Xth, XIth, and XIIth Reports, pp. 56, 573, 643, 402, and 272. It is on the Sierra Buttes Mountain, at Sierra City. The elevation at the croppings is 6,400′, and at the lowest tunnel 4,100′. The property is virtually worked out. A few pillars in the upper works are being robbed. Fifteen men are at work. S. Thomas, of Sierra City, superintendent.

Slate Creek (*Phil. Doris*) *Mine* (Placer).—It is 6 miles E. from La Porte, at 4,000′ elevation, and consists of a tailings claim extending 3 miles long. The tailings were worked with a giant and raised 45′ by a hydraulic elevator. Four hundred feet of the channel has been worked and 14,000 cu. ft. moved the past season from a pit 90′ wide and 15′ deep, in places. The creek has a 2% grade. The gold is coarse and is distributed throughout the tailings. The flume for washing is 2′ wide and set on a 3″ grade, and paved with rock. Two hundred inches of water were obtained from Gibson Creek through 3 miles of 5′x 3′ flume, with ¼″ grade per rod, delivered under 300′ pressure, through 600′ of 22″ to 11″ pipe, to a No. 1 giant with 3″ and 4″ nozzles. The elevator nozzle is 6″ in diameter. The water season lasts from April to July. Eighteen men are employed during the season. W. J. Scrutton, of La Porte, manager.

Sierra Gold Co.'s Mine (Quartz).—It is on the East Fork of North Fork of the Yuba River, 2 miles E. of Downieville, at 3,200′ elevation at No. 3 tunnel. The property comprises seven claims on the *Ackley* or *High Commissioner* vein; two on the *Crouse* vein; and seven on the *Mexican*. These parallel veins have a N.W. course, with a distance of 400′ between the Ackley and Crouse; thence 1,000′ to the Hillside, and 200′ thence to the French, vein. There are three working tunnels, 50′, 160′, 440′ long, and a 15′ shaft, below the lowest one on the Ackley vein, which is 20′ wide on an average. The difference between the highest outcrop and the lowest tunnel on the Ackley is 100′. The lowest tunnel on the Ackley is being pushed ahead to cut the vein. On the Crouse vein, 12′ to 14′ wide, are four tunnels, 100′, 100′, 165′, 365′ long. These ores carry about 5% of arsenical pyrites, which appear frequently quite massive. A water-right of 3,000 miner's inches is held by the company, and is to be diverted from East Fork of the North Fork of the Yuba and delivered through 500′ of flume, under a head of 40′, at the company's mill site. Four men are employed. C. Purdy, of Downieville, manager.

Slug Cañon Tunnel Co.'s (Van Clieff) Mine (Quartz).—It is in Slug Cañon, 1½ miles S. from Downieville, at 3,500′ elevation. Two veins, 80′ apart, course N. and S. and dip E. The larger one is 8′ and the smaller one 20″, between slate walls. A cross-cut tunnel near the creek is 400′ long and will have to be extended 300′ to cut the veins. The previous workings were all much higher up on the mountain side. Seven men are at work. I. Copeland, of No. 530 California Street, San Francisco, manager.

Snowdon (Steamboat) Mine (Drift).—It is near the head of Steamboat Ravine, 2 miles S.E. from Alleghany, at 4,450′ elevation, and comprises 120 acres along the Minnesota Ridge channel. This channel has a N. and S. course and is lava-capped. There is on the claim an old tunnel 1,500′ long, but only used at present for a distance of 900′, where short upraises of 4′ to 5′ reach the rim gravel; the center of the channel is about 200′ yet ahead. The tunnel has 3′ caps and 5′ posts, with 6′ spread. The bedrock is serpentine and slate. A 100′ air-shaft ventilates the tunnel. The breasts are 2½′ wide in gravel and 1½′ in bedrock, and are 20′ wide, timbered with post and cap; no gravel is being extracted. Wash-water is obtained from springs and carried to three small reservoirs by 900′ of ditch, permitting ten minutes washing with 3″ nozzle under 60′ pressure, through 150′ of 6″ pipe. There are 160′ of 12″ tail-flumes paved with Hungarian and rock riffles. The gold is mostly rough. Six men are at work. L. Evans et al., of Alleghany, owners.

South Fork Co.'s Mine (Drift).—See our XIIth Report, p. 272. It is ¼ mile S.W. from Forest City, at 4,900′ elevation, and comprises 400 acres. The channel passes under the ridge dividing Forest City from Alleghany. A former company, in driving the tunnel for this purpose, got off the course and missed the channel; the present company utilized the front portion of the tunnel, which passes directly under and across the Live Yankee channel, and then took their bearings and grade for a point beyond, where the channel had been established in former days through an incline shaft. The channel is known as the Bald Mountain lava channel, although it is a white quartz channel. The tunnel is being driven ahead at the rate of 8′ per day in slate bedrock, which if continued will reach the tunnel about May 1, 1896. The channel is 500′ wide, and there are about 4,000′ of the channel on the company's ground. Where the Bald Mountain Extension Co. crossed this channel in driving their main tunnel they accounted for $200,000 taken out. The lowest average was $2 50 per car. Seven men are employed at present. J. O. Jones, of Forest City, manager.

Sunset Mine (Drift).—See our XIIth Report, p. 273. It is about ¼ mile below Goodyear's Bar. Idle. J. R. Williams et al., of Goodyear's Bar, owners.

Taber Gold Mine (Drift).—See our XIIth Report, p. 273. It is ¼ mile S. of Gibsonville. Idle. H. Taber, of Gibsonville, owner.

Thistle Shaft.—See Feather Fork Gold Gravel Co.

Tippecanoe Mine (Hydraulic).—It is 5 miles E. of Camptonville, at 4,200′ elevation. The bank has 25′ of gravel, capped with pipe-clay. The water is diverted from Oregon Creek, through 6 miles of ditch with ½″ grade per rod and a capacity of 500 inches, and is delivered under 70′ pressure to a No. 3 giant using a 3″ nozzle, through 300′ of 16″ pipe. The restraining dam is built of rock and brush, 21′ high, 55′ long on top, and 20′ thick at the base. Five men are employed. G. Perrant, of Tippecanoe, owner.

Tough and Hardy Mine (Placer).—See our XIIth Report, p. 273. It is 1½ miles E. of Camptonville. Idle. W. B. Meek et al., of Camptonville, owners.

True Fissure Mine (Quartz).—See our XIth and XIIth Reports, pp. 405 and 274. It is 15 miles E. of Downieville, at 7,400′ approximate elevation, and comprises six claims. Since our last Report further developments have been made, chiefly in driving the main tunnel ahead. Five men are employed. G. Reynolds and — Bishop, of San Francisco, owners.

Union Consolidated (*Happy Hollow*) *Mine* (Drift).—See our XIIth Report, p. 274. It is 5 miles N.E. from La Porte. Temporarily idle. G. W. Miller, of Port Wine, superintendent.

Watts Mine (Drift).—See our XIIth Report, p. 274. It is between the North Yuba River and Big Humbug Creek, 9 miles N.E. of Camptonville. J. Watts, of Camptonville, owner.

Wide Awake Mine (Drift).—See our XIIth Report, p. 274. It is on Alabama Hill, 7 miles N.W. from Downieville, at 5,645′ elevation. Since our last Report they are prospecting for back part of channel. Water is diverted from Little North Fork of the Yuba, through an 8-mile ditch, 3′ wide, 2′ deep, and of 800 miner's inches capacity. Water season lasts three months. Eight men are at work. J. Brandt, of Downieville, manager.

William Tell Mine (Quartz).—See our Xth and XIIth Reports, pp. 653 and 275. Idle. Caspar Joos et al., of Sierra City, owners.

Young America Mine (Drift).—See our XIIth Report, p. 275. It is at Forest City. Idle. B. F. Dickinson et al., owners.

Young America Mine (Quartz).—See our Xth and XIIth Reports, pp. 643 and 275. The tailings from the mill of this property were saved, and are said to aggregate 150,000 tons. They and the mine were recently sold and a cyanide plant of 100 tons daily capacity erected, which commenced operations in September, 1896. S. M. Green et al., of Milwaukee, Wis., owners; Oscar Cecil, of Sierra City, superintendent.

MILLS IN SIERRA COUNTY.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of Each, in Lbs.	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
					No.	Character.	No.	Capacity.		
Bonanza		40	850	70–80						
Butcher Ranch		12	750							
Buttes Saddle	Water	10	750	13						
Chips	Water	10	750							
Cleveland	Water	12	850	26						
El Dorado and Bullion	Water	10	750	14	2	Johnston				
Gold Bluff	Water	20	900	40	4	Johnston				
Golden King*	Steam	10	850	24	4	Triumph				
Gold Valley	Elect.	25	850	50	7		1	4 tons.		
Mountaineer	Water	10	850	30						
Phœnix		10								
Plumbago	Steam	10	850	25	4	Frue				
Rainbow	Water	10	850		4	Frue				
Rising Sun		10	850							
William Tell		3								
Young America		40								

* Power to be changed to water.

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN SIERRA COUNTY.

Name of Mill or Mine.	Power.	Number	Character.	Diameter	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
						No.	Character.	No.	Capacity.		
Bull of the Woods	Steam	1	Huntington	4′							

Siskiyou County.

Abers Mine (Drift).—It is on Slide Creek, 5½ miles S.W. of Callahan, at 4,820′ elevation. It is worked by drifting the creek bank. Thomas Abers, of Callahan, owner.

Ahlgren Mine (Hydraulic).—See our XIIth Report, p. 276. It lies on Salmon River, 5 miles below Sawyer's Bar, at 2,240′ elevation. The bank is 80′ high, with 20′ of gravel near the soft, decomposing syenite bedrock. The sluices are 20″x 24″ and 1,500′ long. Water is taken from Little North Fork through 4 miles of 2½′x 2′ ditch and flume, with a 12′ grade per mile. There are 800′ of 12″ and 8″ pipe, and a No. 1 giant working under 150′ pressure. Bowlders are removed by a large derrick, driven by a hurdy wheel. A sawmill, with 56″ saw, belongs to the mine. About 1 acre of ground was piped off during 1895. A. Ahlgren, of Sawyer's Bar, owner.

Albers Mine (Hydraulic).—It is on Klamath River, 14 miles below Cottage Grove, at 940′ elevation. Water is furnished by a ditch 1 mile long; 100′ of 7″ hose and a 2″ nozzle are used. The 2′ sluices are set on an 8″ grade. Henry Albers, of Cottage Grove, owner.

Allen Mine.—See Green Mountain.

Altoona Mining Ditch.—See Campbell Mine.

Amazon Mine (Quartz).—It is 2 miles S. from Henley, in Cottonwood District, at 2,325′ elevation. There are several veins; the principal one, 4′ wide, trends E. and W., and dips 45° N., in a greenstone formation in close proximity to sandstone. The quartz carries about 1% of iron and copper sulphurets. The developments consist of a 15′ incline and several open cuts, about 30′ long, along the croppings. The ore is reduced in a 10-stamp mill on the adjoining property. Two men are at work. C. B. & J. O. Jillson, of Henley, owners.

American Bar Mine (River).—It is on the Klamath River, 9 miles W. from Hornbrook, at 2,035′ elevation. It consists of 20 acres on a bar, and a quartz location, 3,000′ by 600′, on a 4′ vein, trending N.W. and dipping S.W., between slate and diabase walls. The quartz carries a large percentage of sulphurets, but is not being worked. On the bar there are two water-wheels; one, 15′x 18″, for hoisting, and one, 16′x 22″, to run a gravel elevator and Chinese pump. A 4-ton derrick, with a 75′ boom, is also in use. The gravel is 35′ to the bedrock, carrying gold throughout, part of which is quartz gold. Six hundred cubic yards of gravel are moved in twenty-four hours, averaging 75 cents per yard. Three hundred feet of sluices, set on an 8″ grade and furnished with Hungarian riffles, are required for washing; these are cleaned every day. Twenty men are employed, day and night. An incorporated company, owner; James Main, of No. 265 Second Street, Portland, Or., secretary; J. C. Bayer, of Hornbrook, superintendent.

Ampback (*Fagundez*) *Mine* (Quartz).—See our XIth and XIIth Reports, pp. 432 and 276. It lies in Eddy Gulch, 3 miles S. of Sawyer's Bar, at 3,060′ elevation. Worked through four tunnels, 200′ to 500′ long, on the vein. The ledge is 3″ to 12″ thick, and dips 20° to 75° E. During 1895, 350 tons of ore were extracted and milled in the 5-stamp mill, with 750-lb. stamps, driven by a Pelton wheel. Idle. R. L. Fagundez, of Etna, owner.

Anderson Mine (Placer).—It is on Eddy Gulch, 2½ miles S. of Sawyer's Bar, at 2,870′ elevation. The claim contains 10 acres, and is worked by ground-sluicing and drifting. John Anderson, of Sawyer's Bar, owner.

Andrews Mine (River).—See our XIIth Report, p. 276. It lies on Klamath River, 1 mile above Hamburg Bar, at 1,780′ elevation. Coffer-dams are being built in the Klamath River to inclose about ½ acre, at a place where the water is from 6′ to 10′ deep. The coffer-dams are made of log cribs pinned together with oak saplings and lined with 1″ boards; they are filled with rock and earth. It is supposed that bedrock lies 15′ to 20′ below water-level. There are three large current-wheels, resting partly on the coffer-dam and partly on a pier. One is 20′ in diameter and 16′ wide, with buckets on the rim to dip water; and the other two, 20′ in diameter and 7′ wide, will drive large Chinese pumps and furnish power for the derrick. Martin Andrews et al., of Scott Bar, owners.

Andrews Mine (Hydraulic).—It is 1½ miles N. of Scott Bar, on the second bench, at 2,140′ elevation. Water is taken from Muck-a-Muck Gulch, through a ditch 1½ miles long. There are on the claim 2,000′ of 6″ to 14″ pipe and a No. 2 giant, working under 300′ pressure. Idle. William Kittlewood, of Hamburg, owner.

Auberry Mine (Hydraulic).—See our XIIth Report, p. 277. It lies on Klamath River, 1 mile below Cottage Grove, at 1,075′ elevation. The bank is 40′ high, with 15′ of gravel. The 22″ wide sluices are set on an 8″ grade. A ditch 1 mile long, conveys water from Auberry Creek and delivers it, through 450′ of 10″ pipe, to a No. 2 giant under 150′ pressure. Roland R. Auberry, of Cottage Grove, owner.

Ayles & Dunn Mine.—See Indian Bar.

Bailey Mine (Drift).—See our XIIth Report, p. 277. It lies on Klamath River, 6½ miles below Seiad, at 1,550′ elevation. Worked by drifting in the bank of the river. C. M. Bailey, of Seiad, owner.

Baker Mine (Hydraulic).—See our XIIth Report, p. 277. This claim lies on Indian Creek, 6 miles N. of Fort Jones, at 3,150′ elevation. It contains 20 acres of gravel, 30′ to 35′ deep. About 600 inches of water are taken from Indian Creek through a mile of ditch and 800′ of 6″ pipe, producing a pressure of 85′ in a No. 1 giant. George Baker & Sons, of Fort Jones, owners.

Baker and Coyote Mine (Hydraulic).—It lies on Indian Creek, 6 miles N. of Fort Jones, and is nearly worked out. Abandoned.

Banner Mine (Quartz).—See our XIIth Report, p. 277. It is in Quartz Valley, near Evans' Gulch. The vein is 5′ wide and dips 45° E. Developed by a cross-cut tunnel 300′ long, and two drifts on the vein, 300′ and 600′ long. The ore is worked in an arrastra. Henry J. Diggles, of 57 Crocker Building, San Francisco, owner.

Barry & Co.'s Mine.—See Whistlehear.

Barton Mine (Drift).—It is situated on Klamath River, ½ mile below Oak Bar, at 1,900′ elevation. Worked by drifting in the bank of the river, 15′ above water-level. H. J. Barton, of Oak Bar, owner.

Barton & Lichen Mine (River).—It lies on Klamath River, 5 miles below Oak Bar, at 1,850′ elevation. They are working a bar in Klamath River, 10′ below water-level. A Chinese pump and the derrick are driven by an overshot wheel. Water for power is taken from Horse Creek by a ditch 2 miles long. Sing Co., of Oak Bar, owner.

Beamer Mine (Placer).—It is on Russian Creek, 10 miles N.E. of Sawyer's Bar. Worked by ground-sluicing. Idle. James Carr's heirs, owners.

Bear Bar Mine (Drift and Placer).—See Lee Han.

Beard Bros.' Mine (Drift).—It lies on the Salmon River, 9 miles below Cecilville, at 1,850′ elevation. Worked by drifting in the bank of the river. Beard Bros., of Black Bear, owners.

Beebee Bar Mine (Hydraulic).—See our XIIth Report, p. 277. It is on Scott River, 1½ miles below Scott Bar, at 1,660′ elevation. Water is taken from the San José Co.'s ditch, through 1,000′ of 8″ pipe, and delivered to the No. 1 giant under 300′ pressure. During the dry season mining is done in the river-bed, 10′ below water-level. A brush wing-dam in the river and a 3′ ditch, ¾ mile long, furnish water for the sluices. Two current-wheels drive a Chinese pump and derrick. Quong Hong Co., of Oak Bar, owner.

Bee Lee Mine (Drift).—See Black Lead.

Bender Mine (Quartz).—See our XIIth Report, p. 277. This is on Miner's Creek, 7 miles S.E. of Etna. There are two tunnels, 70′ and 100′ long, and an incline 75′ deep. The vein is about 4′ thick and dips 50° N.W. A Huntington mill, driven by a water-wheel, is on the premises. Idle. W. Chambers et al., of Etna, owners.

Bennett Mine (River).—See our XIIth Report, p. 277. It is in the bed of Scott River at Scott Bar, at 1,900′ elevation. The wing-dam incloses about ¼ of an acre; three current-wheels furnish power for a pump, a hoist, and raise water for the sluices. The bedrock lies 22′ below water-level. William T. Bennett, of Oak Bar, owner.

Bennett Mine (Hydraulic).—See Horn.

Berry Mine (Drift).—It is on Klamath River, 5½ miles above Happy Camp, at 1,450′ elevation. Worked by drifting in the bank of the river. John Berry, of Happy Camp, owner.

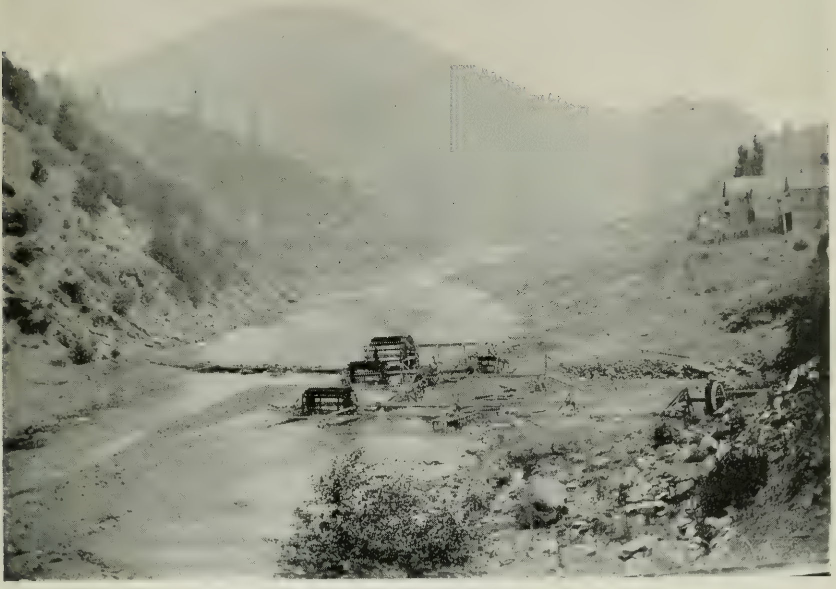
Better Yet Mine (Quartz).—This new location lies on the head of Barkhouse Creek, 13 miles N.E. of Scott Bar, at 3,010′ elevation. A 10′ open cut exposes a 4′ vein of quartz, which dips nearly vertically and courses N. and S. C. C. Humphrey, of Scott Bar, owner.

Big Ben Mine (Placer).—See our XIIth Report, p. 277. It lies on Shackleford Creek, in Quartz Valley. Water for sluicing is taken from the creek. Many large bowlders are found on the bedrock, and make mining expensive. S. E. Adams, of Fort Jones, superintendent.

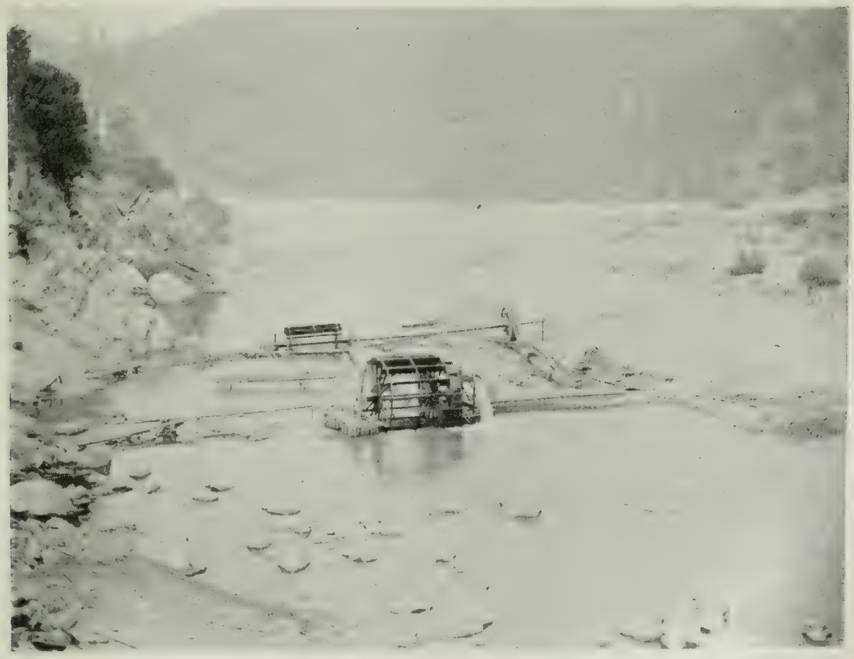
Big Ledge Mine (Quartz).—See our XIIth Report, p. 277. It lies E. of Mugsville, in Quartz Valley. Idle. H. J. Diggles, of Fort Jones, owner.

Bigelow Mine (River).—This is on the North Fork of Salmon River, 4½ miles below Sawyer's Bar, at 2,120′ elevation. The claim lies in the river, and embraces 6 acres; the bedrock is 18′ below water-level. A dam in the river 9′ high, built of logs, raises the water to a 4′x1½′ flume, ½ mile long, and with a 9′ grade. The overshot water-wheel drives two Chinese pumps and furnishes power for a large derrick. The sluices are 18″x14″, and set on a 6″ grade. G. F. Bigelow, of Sawyer's Bar, owner.

Billups (*Cleland, Brown & Billups*) *Mine* (Quartz).—See our XIIth Report, pp. 279 and 280. This lies at the head of McKinney Creek, 11 miles N.E. of Scott Bar, at 4,320′ elevation. A tunnel 50′ long exposes a 4′ vein of quartz. Assessment work only is done. Robert Billups, of Oak Bar, owner.



Current Wheels, Bennet River Mine.



Current Wheels, Brady Mine, Scott River.

Black Bear Mine (Quartz).—See our VIIIth and Xth Reports, pp. 620 and 656. It is on Black Bear Creek, 8 miles S. from Sawyer's Bar, at 3,680′ elevation. In the *Yellow Jacket*, which lies north of the *Black Bear*, two veins were worked near the surface through short tunnels. Later the adit of the Black Bear was extended north, and the veins, which had come together, were cut at a depth of 800′ below the surface. Considerable good ore was stoped from above this level and work is now being prosecuted—tunnels having been driven on the vein 300′ higher to give air and to facilitate the handling of timbers and disposing of waste. In March, 1895, a vein, 4′ to 8′ thick, being the southern extension of the Black Bear vein, was discovered beyond the dike, and a large force of men were taking out the surface ore in August, 1895. The foot-wall is porphyry, and the hanging-wall a soft black slate. The ground is very heavy, owing to the disintegration of the slate. The ore is a crumbly mass of crushed quartz and clay, stained red by iron. The black slate of the hanging-wall is more than 1,000′ thick, and can be traced nearly to the South Fork of Salmon River. Below the croppings, banded quartzites of great thickness are exposed, and beyond them a wide belt of serpentine crops out. The ore is handled several times by tramways, gravitation inclines, and self-delivering chutes before it reaches the mill, 2 miles below the mine. The 16-stamp mill has lately been reconstructed, and self-feeders and four Frue concentrators added. The ore contains about 2% of rich sulphurets, and 500 tons were crushed per month during 1895. Hon. John Daggett, of San Francisco, owner; Ben Daggett, of Black Bear, superintendent.

Blackburn Mine (Hydraulic).—This lies on Salmon River, 6 miles above Summersville. It is a recent location, and a ditch is being dug. Blackburn Bros., of Cecilville, owners.

Blackhawk Mine (Quartz).—See Claughry.

Black Jack Mine (Drift).—See our XIIth Report, pp. 278 and 469. It is situated in Cottonwood Mining District, 1½ miles W. from Hornbrook, at 2,625′ elevation, and carries a large body of auriferous conglomerate, which is crushed in a stamp mill. The mine was worked under bond until the small prospecting mill was destroyed by fire, when the property was closed. Considerable tunneling has been done on both sides of Rancheria Creek; the main tunnel has been driven 300′, a little W. of N. The company obtains 100 inches of water from Rancheria Creek, through 1½ miles of ditch, under 110′ head. W. H. Ritchie, of Henley, superintendent.

Black Lead (*Bee Lee*) *Mine* (Drift).—This is situated near Greenhorn Gulch, 2 miles S.W. from Yreka, at 2,640′ elevation. The gravel channel is opened through a 4′x 6′ vertical shaft, 60′ deep, and furnished with a 6″ jackhead pump, with 3′ stroke, and a hoisting drum operated by an 8 H.P. engine. The gravel has been breasted W. and S. from the shaft, and carries a large percentage of bowlders, the breasts being carried 4½′ to 5′ high and 24′ wide. Both square-set and post and cap timbering are used. The gravel is washed through six boxes, set on an 8″ grade, with water pumped from the mine, no quicksilver being used. The gold is coated black. At present the mine is being worked by 10 men, under a five years' lease to J. W. Scheld. Mrs. Bee Lee, of Yreka, owner.

Blake's Mine (Drift).—It lies at Sawyer's Bar, at 2,380′ elevation, and is worked by drifting in an old channel back of town. Peter Blake, of Sawyer's Bar, owner.

Blind Lode Mine (Quartz).—See our XIIth Report, p. 278. It lies ¼ mile W. of Oro Fino, at 3,420′ elevation. There are three tunnels on the 12″ vein, 300′ to 400′ long. H. J. Diggles, of Fort Jones, owner.

Bloomer Mine (Hydraulic).—See our XIIth Report, p. 278. It is on Salmon River, 6 miles below Forks of Salmon, at 975′ elevation, and contains 60 acres. Water is taken from Nordheimer Creek, through a 4′ ditch 3 miles long with a 19′ grade; 1,200′ of 11″ pipe and a No. 3 giant, under 200′ pressure, are used. The sluices are 24″ wide and have an 8″ grade. W. P. Bennett, of Forks of Salmon, owner.

Blue Mine (Quartz).—See Schroeder.

Blue Gravel Mine (Drift).—It is 1½ miles S. from Yreka, at 2,640′ elevation. During the past year a 100′ shaft has been sunk to bedrock, and a derrick, run by a 7 H.P. engine, is used for hoisting. The gravel mined is about 4′ high. Water is obtained from Greenhorn Gulch and also from the Yreka ditch. Six men are employed in the mine and 4 on the surface. A. Lee, of Yreka, owner; Austin & Raines, operators.

Boles Claim (Placer).—See our XIIth Report, p. 278. This is on Horse Creek, 15 miles N.W. of Oak Bar, at 2,260′ elevation. Water for sluicing is taken from Horse Creek; the ditch is 1,200′ long and 3′ wide. Hungarian riffles are used in the sluices. W. Robertson, of Scott River, owner.

Bonanza Mine (Quartz).—See our XIIth Report, p. 278. It lies on Grizzly Creek, a tributary of Indian Creek, 2½ miles N. of Hooperville, at an altitude of 3,860′. Idle. H. J. Diggles, of Fort Jones, owner.

Bostetter Mine (Drift).—This lies in North Fork Cañon, 2 miles S. of Sawyer's Bar, at 2,740′ elevation. It is worked by drifting in a second bench. Charles Bostetter et al., of Sawyer's Bar, owners.

Bowersox Mine (Hydraulic).—See our XIIth Report, p. 278. It lies ¼ mile above Somes Bar, on Salmon River. Idle. W. H. Bowersox, of Somes Bar, owner.

Boye Mine.—See Scott River Mining Co.

Boyle Mine (Quartz).—See our XIIth Report, p. 278. It is in the Humbug District, N.W. of Yreka, at 4,700′ elevation, and includes eight claims. The vein, from a few inches to 3′ in width, courses N.E., and dips about 45° S.E., in a serpentine country rock; the main cross-cut tunnel is 900′ long; it is ventilated by a small Root blower and wooden air boxes. A second tunnel, 150′ above, cross-cuts 200′ to the vein. The steam-power mill contains four 750-lb. stamps, discharging the pulp to a 3′ Huntington mill, through a No. 4 screen. Timber is abundant, though little is required in the mine. The property is in litigation, and idle. Osborne & Gonzales, of San Francisco, owners.

Brady Mine (River).—It is in the river-bed at Scott Bar. Bedrock lies 16′ below water-level. A wing-dam made of brush and earth incloses the mine. The gravel is handled by wheelbarrow. A dip-wheel and a pump-wheel are driven by the current. A. Brady, of Scott Bar, owner.

Brass Wire Mine (Placer).—It is about ½ mile S.E. from Henley, at 2,350′ elevation, and contains 80 acres. The gravel carries fine gold throughout, lies on sandstone bedrock, and is 6′ to 20′ thick. It is washed with 540 inches of water through a No. 8 giant using 2″, 3″, and 4″ nozzles, under 80′ pressure, derived from Cottonwood Creek, through 6 miles of ditch. Bedrock flume is cleaned up once a month.

Four men are employed. W. H. Smith and — Harvey, of Henley, owners.

Brazil Co.'s Mine (Placer).—It is 1 mile N. of Hawkinsville, and contains 40 acres of ground; a half interest in the lower Greenhorn Ditch, which is nearly 10 miles long and takes its water from Greenhorn Creek, also belongs to the claim; this yields from 150 to 200 inches of water during four months. The gravel bank, 14′ in height, carrying few bowlders, is worked by ground-sluicing, with a little drifting during the summer months. The boxes are 2′ wide and 16″ high, with slat riffles. The gold is coarse next the bedrock. Eight men are employed during the season. Manuel A. Brazil et al., of Hawkinsville, owners.

Bret, Lacy & Barton Mine.—See Horse Creek Mining Co.

Brown Mine (Hydraulic).—It lies 6 miles E. of Cecilville, on the East Fork of Salmon River. Water is taken out of East Fork by a 3′ ditch, 3 miles long; 700′ of 10″ pipe and a No. 1 giant, under 120′ pressure, are used. Thomas George, of Cecilville, owner.

Brown & Billups Mine.—See Billups.

Brown Bear Mine.—See Golden & Eveleth.

Brunt Mine (Drift).—See our XIIth Report, p. 279. It lies ½ mile N. of Scott Bar, at 1,840′ elevation. Worked by drifting in the bank of Scott River. John Brunt, of Scott Bar, owner.

Buckeye Bar Mine (River).—See our XIIth Report, p. 279. It lies on Klamath River, 3 miles above Oak Bar, at 1,985′ elevation. About an acre of gravel is inclosed by coffer-dams in the river. Bedrock lies 10′ below water-level; 3 large current-wheels furnish power for a derrick, a Chinese pump, and to dip water for the sluices. Fifteen Chinese are at work. Lem Co., of Oak Bar, owner.

Buckhorn (U. S.) Mine (Placer and Drift).—See Kellner, Doescher & Mahr.

Bunker Hill Mine (Hydraulic).—See our XIIth Report, p. 279. It is on Klamath River, 15 miles below Happy Camp, and contains 160 acres, at 1,260′ elevation. Water is taken from Independence Creek, through a 3′x 2′ ditch 4 miles long, with an 8′ grade. There are 2,000′ of 11″ pipe, and two No. 2 giants under 100′ to 400′ pressure. The bank is 150′ high, with 50′ of gravel. George Temple, of Happy Camp, owner.

Burk Mine (Drift).—This is on Klamath River, 1 mile below Oak Bar, at 1,895′ altitude. Worked by drifting in the bank of the river. William Burk, of Oak Bar, owner.

Burns Mine (Hydraulic).—See our XIIth Report, p. 279. It is in Eddy Gulch, 2 miles S. of Sawyer's Bar, at 2,800′ elevation. There are 500′ of 7″ pipe, and a No. 1 giant working under 100′ pressure. A ditch ¾ mile long conveys water from Eddy Gulch. The 18″x 20″ sluices are set on an 8″ grade. William Burns, of Sawyer's Bar, owner.

Butza Mine (Hydraulic).—It lies on the Klamath River, 10½ miles below Happy Camp, at 1,540′ elevation. A ditch 1½ miles long conveys water from a small creek to the claim. There are 350′ of 9″ pipe and a No. 1 giant. The bank is 20′ high and all gravel. The claim lies on the second bench, and contains 20 acres. Jean Butza, of Happy Camp, owner.

California (Oregon) Bar Mine (Drift).—It is on the Klamath River, 6½ miles W. from Hornbrook, at 2,075′ elevation. A 35′ shaft to bedrock is used for hoisting and pumping. The gravel is free and breasted

6′ high, timbered with post and cap; the gold is coarse, and near the bedrock. A 20′ river-wheel furnishes power for pumping and hoisting. Six men are at work, Ellis Price & Co., of Hornbrook, owners.

Campbell Mine (Hydraulic and Drift).—See our XIIth Report, p. 279. This is on Sucker Flat, in Quartz Valley, and comprises 1,500 acres, lying at 3,200′ elevation. About 8,000 inches of water are used. The pipe is 11″ to 22″ in diameter, and two No. 3 giants are used under 150′ to 210′ pressure. The bank is 20′ to 45′ high, with about 12′ gravel. The sluices are 4′ wide and are set on a 3″ grade. During 1894, about 3½ acres of bedrock were cleaned up, and in 1895, 2½ acres. No drifting has been done since 1892. The company owns three ditches. *The Altoona ditch* takes water from Kidder Creek, is 14 miles long, 5′ wide and 2½′ deep, and is built on a 13′ grade. *The Shackleford ditch* takes water from Shackleford Creek; it is 12 miles long, 6′ wide, 3′ deep, and has a 7′ grade. *The China ditch* takes water from Mill Creek, is 5 miles long, 4′ wide, 3′ deep, and has a 7′ grade. The R. H. Campbell Gold Mining Co., owner; Charles Roberts, of Etna, superintendent.

Campbell & Austin Mine (Placer).—See Quinn & McConnell.

Cannon Mine (Quartz).—See our XIIth Report, p. 279. This is on the South Fork of Salmon River, 6½ miles above Forks of Salmon. There is a tunnel 100′ long on the claim. The vein is about 6″ wide, and stands nearly vertically. Joseph Cannon, of Black Bear, owner.

Cariboo Mine (Quartz and Placer).—It is on the South Fork of Salmon River, on the flank of Cariboo Mountain, 23 miles W. of Trinity Center, at 5,150′ elevation, and comprises three full claims parallel to each other. The center claim is on an auriferous porphyritic dike, 100′ wide, while veins on the other two claims course E. and W.; the upper one is 10′ wide, between slate and porphyry, and nearly vertical; the lower one is 5′ wide, between walls of porphyry. A 250′ tunnel has been run on the dike; an 80′ one on the upper claim; a 200′ one on the west end; and a 128′ one on the east end of the lower claim, where there is also a 16′ shaft. The surface along the outcrops yields well for piping. Five men are at work. G. & J. Abrams, of Abrams, Trinity County, owners.

Carl & Shaw Mine (Quartz).—See our XIIth Report, p. 279. It lies in White's Gulch, 5 miles S.E. of Sawyer's Bar. It is an extension of the Smith & Merriman claim. Idle. Carl, Shaw, et al., of Sawyer's Bar, owners.

Carter Mine (Hydraulic).—It is on the Klamath River, 6 miles below Cottage Grove, at 1,020′ elevation. Water is taken from several small creeks and collected in a reservoir. The bank is 50′ high and shows 15′ of gravel. There are 500′ of 11″ pipe and a No. 2 giant, under 150′ pressure, on the claim. Norman Carter, of Cottage Grove, owner.

Carter Mine (Drift).—This is 6 miles S.W. of Callahan, at 5,320′ elevation. It is worked by drifting in the bank of Slide Creek. Joseph Carter, of Callahan, owner.

Cartwright & Phillips (*Mountain Belle*) *Mine* (Quartz).—See our XIth Report, p. 445. It is on the North Folk of Humbug Creek, 16 miles N.E. of Yreka, at 3,500′ elevation, and comprises 3,000′ by 600′. The vein averages 2′ in width, trends N.E., and dips 45° S. Since our last Report, a block of ground 80′ long by 200′ deep has been stoped; a new tunnel cross-cuts the vein 80′ below, from which 150′ of drifts on the vein have been run, preparing 275′ for stoping. Four men are at work. Cartwright & Phillips, of Humbug Creek, owners.

Casey Mine (Hydraulic).—It lies at the Forks of Eddy Gulch, 2½ miles S. of Sawyer's Bar, at 2,930′ elevation. There are 430′ of 6″ pipe, and a No. 1 giant working under 160′ pressure. The bank is 25′ high and all gravel, and the derrick is run by an overshot water-wheel. Water is taken out of West Fork by a ditch ¼ mile long. Smith & Hamilton, of Sawyer's Bar, owners.

Cash Mine (Hydraulic).—This is on the South Fork of Salmon River, 3 miles above Forks of Salmon, at 1,870′ elevation. Water is taken from the Red Hill ditch, through 500′ of 14″ pipe, and delivered to a No. 2 giant under 90′ pressure. Parker & Sons, of Etna, owners.

C. B. & Q. Mine (Quartz).—It lies ½ mile S. of Oro Fino and S. of the Pitz Mine. The developments consist of two tunnels, 30′ and 40′ long, respectively; the vein carries 7″ of quartz. Idle. David Ray et al., of Oro Fino, owners.

Centennial Mine (Placer).—See our XIIth Report, p. 279. It is at Gottville, at 1,950′ elevation, and comprises 11 acres. The gravel is from 40′ to 50′ thick. Idle. N. G. Gott et al., of Gottville, owners.

Challenge Mine (Quartz).—It is between the Forks of Deadwood Creek, 2 miles N.W. of Deadwood, at 3,720′ elevation. The quartz vein is about 11″ thick, and shows crystals of galena and pyrrhotite. Two tunnels are driven on the vein, each about 150′ long. The vein dips 35° S.E. An arrastra, driven by an overshot wheel, is on the property. Lewis Davis, of Fort Jones, owner.

Chaingang Mine (Hydraulic).—This lies 3½ miles S.W. of Callahan, on the South Fork of Scott River, at 3,790′ elevation, and comprises 60 acres. The property is bonded to the Scott River Mining Co., and is being prospected by it. Fred Hellmuth, of Callahan, owner.

Chapman China Mine.—See Scott River.

Charter Oak Mine (Drift).—It is 3 miles N.W. from Hornbrook, between Rancheria and Ditch creeks, at 2,450′ elevation. The claim contains 39½ acres on the blue gravel lead, and adjoins the Black Jack. It is opened through a tunnel 184′ long; no breasting has been done yet. Water is derived from Ditch Creek. J. W. Lettner, of Hornbrook, owner.

Charter Oak Mine (Quartz).—It is situated on the south bank of Cherry Creek, 10 miles S.W. from Yreka, at 4,700′ elevation. The vein, about 15″ wide, courses N. and S., and dips 45° E., between slate and greenstone, carrying a good grade of quartz. Three tunnels, two 100′ and one 75′ long, run on the vein, and a 50′ shaft has been sunk above the upper tunnel. Two men are employed. D. Barnes, of Yreka, owner.

Cheng Song Mine (Placer).—It is on Horse Creek, near Oak Bar, and employs 3 Chinese.

China Claims (Placer).—They are situated on McAdam Creek, where two Chinese companies are working over old diggings; one with 5 and the other with 15 Chinese.

China Creek Mine (Hydraulic).—This is on Klamath River, 7 miles above Happy Camp, at 1,470′ elevation. The bank is from 10′ to 60′ high, with 5′ to 25′ of gravel. Water is obtained from China Creek. The ditch is 3′x 2′, and 1½ miles long. There are 3,000′ of 11″ and 15″ pipe, and two No. 2 giants. The sluices are 800′ long and 24″ wide, with a 6″ to 8″ grade, and paved with block riffles. Lee & Silva, of San Francisco, owners.

Chinese Mine (Placer).—This lies near Cayuse Creek, 6 miles above the mouth of Humbug Creek, and employs 5 Chinese.

Clapboard Mine.—See Finley.

Classic Hill Mine (Hydraulic).—It is on Indian Creek, 11½ miles N. of Happy Camp, and contains 40 acres, at 2,174′ elevation. The bank is 50′ high, and consists of decomposed, slaty bedrock, carrying gold. Water is taken from West Branch Creek, through 3½ miles of 3′ ditch; there are 3,000′ of 11″ and 15″ pipe, and two No. 3 giants under 300′ pressure. Matthews & Vogan, of Fort Jones, owner.

Claughry Mine (Quartz).—It is situated on Eliza's Fork of the North Fork of Humbug Creek, 14 miles N.W. from Yreka, at 4,000′ elevation, and consists of three full claims, known as the *Blackhawk*, *Hidden Treasure*, and *Standard*. They are all on the same vein, about 4′ wide, which runs N.E., and dips S.E., between porphyry and serpentine walls. Five short inclines have been sunk on the vein, the deepest being 58′; there are also four cross-cut tunnels, the longest of which is 225′. Four men are at work. C. C. Humphreys et al., of Yreka, owners.

Cleland Mine.—See Billups.

Clellands Bar Mine (River).—It is a claim on the Klamath. Idle.

Cole & Barton Mines.—See our XIIth Report, p. 280. Abandoned.

Collins Mine (Drift).—It lies on Klamath River, 3 miles below Oak Bar, at 1,855′ elevation. It is worked by drifting in the bank of the river. D. Collins, of Oak Bar, owner.

Collins Mine (River).—It is on Klamath River, 2 miles below Oak Bar, at 1,885′ elevation. Worked by sluicing in the river. D. Collins, of Oak Bar, owner.

Columbia Mine (Quartz).—See our XIIth Report, p. 280. It lies on Baldy Ridge, 8 miles N.E. of Scott Bar, at 4,950′ elevation. There is a 110′ cross-cut tunnel and a 150′ drift on the vein, which is 1′ to 3′ wide, dips 15° N., and contains quartz impregnated with sulphurets of iron, copper, and lead. A 10-stamp mill, situated on Mill Creek, and driven by water-power, belongs to the claim. Shut down during litigation. Columbia Gold and Silver Mining Co., owner; R. Denemier, of San Francisco, agent.

Commodore Mine (Quartz).—This is at the head of Barkhouse Creek, 13 miles N.E. of Scott Bar, at 3,490′ elevation. The vein is 2′ wide, dips 80° W., lies between porphyry walls, and carries about 4% sulphurets; two tunnels, each 60′ long, have been driven on the vein. The double arrastra used to crush ore from this mine is a fine piece of work. (See sketch.) It reduces 5 tons of ore per twenty-four hours, and cost, complete and ready to run, about $700. It requires 2 men, one on each shift, and is driven by a wooden hurdy wheel, 18′ in diameter, using 30 miner's inches of water, supplied through a 7″ pipe with a 2″ nozzle, under 100′ pressure. The two grinding pits are situated one on each side of the water-wheel, so that its shaft, *L*, transmits the power by pin-wheels (at right angles to each other) to the arrastra shafts, *H H*. The horizontal pin-wheels, *I I*, have 51 perpendicular hardwood pins, 2″ in diameter, 4″ in length, and set 4″ apart from center to center. The pin-wheels, *K K*, are 3′ in diameter, and are built on the 2′ wheel-shaft. Each has 13 hardwood pins, 2″ in diameter, 4″ in length, driven in horizontally, 4″ apart from center to center. Both wheels are made of sections of 2″ plank, nailed together and bound with two bands of wagon tire. The ends of each shaft terminate in 3″ iron

FOLD OUT

spindles. Each pit is built as follows: Heart-wood center-post, *A*, 8′ long and 18″ in diameter, is set 4½′ in the ground; around this a double floor, *B*, 16′ square and made of 2″ plank, is laid as a foundation. Next, the circular rim, *C*, 12′ diameter, is built of 2″ plank with broken joints, until the top is 38″ above the floor. In the pit thus formed, moist clay, *D*, is rammed, a thin layer at a time, until it is 10″ thick. Next, a bed of dry, clean sand for the pavement is placed upon the clay. The pavement is made of hard, fine-grained rocks (trap), having at least one nearly flat surface, which are placed as close together as possible and the interstices filled with spawls tightly wedged. The annular pavement, *E*, should be as smooth as possible, and with a depression 4″ deep. The drags or mullers, *F F*, are made of the same rock as the pavement, and weigh from 800 to 1,000 lbs. each. By means of eyebolts, let into the rock, they are hung to the drag-arms, *G G*, by chains. The forward edge of the drag is raised about 1″ to allow it to pass over the material, and the eyebolts are so placed that one corner of the drag is somewhat in advance. As it plows through the pulp, a portion is pushed to one side, directly in the path of the next following drag. The relative position and size of the drags must be such that every part of the pavement is passed over in each revolution. The proper speed is 12 revolutions per minute. The *modus operandi* is as follows: Each charge, consisting of 1¼ tons of ore, broken to the size of a walnut, is gradually shoveled into the pit, water enough being added to make a rather thick pulp when the quartz is pulverized. After 8 hours' grinding (more or less, according to the hardness of the ore), 2 ozs. of quicksilver for every $20 gold in the ore is added gradually. After 2 hours more, the speed is reduced to 4 revolutions per minute, to allow the amalgam to settle, water being added to thin the pulp. After another 2 hours, or when a pan scraped along the bottom does not show any amalgam or quicksilver, the pulp is allowed to pass off slowly into the sluices. The outlet for this purpose is made as follows: A slot 16″ high and 6″ wide is cut through the rim, extending from a point 4″ below the top of the rim to the pavement. This opening is closed by pieces of board 2″ high and sliding in guides. By removing these pieces, one by one, 2″ in depth of pulp can be run off each time. The sluices into which the pulp flows are from 12′ to 24′ long, and the bottom covered with amalgamated plates, riffles, and burlap. When the arrastra is emptied to within 3″ or 4″ of the bottom, the outlet is closed, the speed increased, and a new charge of ore put in. About once a month the paving is taken up and the amalgam collected from the sand below, cleaned and retorted. C. C. Humphrey, of Scott Bar, owner.

Connor Mine (Quartz).—This is ¼ mile W. of Oro Fino, near the Last Chance Mine. The ledge is 12″ wide, lies between porphyry walls, and dips 40° S.E. There are two tunnels on the claim, each about 300′ long. Jack Connor, of Oro Fino, owner.

Consolidated Scywash Mine (Drift).—It lies on McAdams Creek, 5 miles N. of Fort Jones, and embraces 52 acres of bottom land, two thirds of which has been mined out. The bedrock lies 25′ to 45′ below the surface. H. B. Madison, of Fort Jones, owner.

Conzetti Mine (Hydraulic).—See our XIIth Report, p. 280. This is on the South Fork of Salmon River, 8 miles above Summerville, and contains 20 acres. There are 300′ of 6″ pipe and a No. 1 giant, under 200′ pressure. S. Conzetti, of Cecilville, owner.

Conzetti Mine (Hydraulic).—It lies 1 mile W. of Summerville, at 2,990′ elevation. Water is taken from Ray Gulch and conveyed, through a mile of ditch and 200′ of 10″ pipe, to a No. 1 giant. The sluices, 24″x 18″, are 50′ long, and have a 5″ grade. S. Conzetti, of Cecilville, owner.

Coon Mine (Quartz).—See Schroeder.

Corey Mine (Quartz).—See our XIIth Report, p. 280. It is on French Creek, 7 miles S. of Etna. The vein is 3′ thick, and is developed by two tunnels 150′ and 300′ long. A water-power arrastra belongs to the mine. Louis Corey, of Etna, owner.

Courts & Smith Mine (Hydraulic).—This lies on Scott River, 1½ miles S. of Scott Bar, on the second bench, at 2,250′ elevation, and comprises 20 acres. Water is taken from the Quartz Hill ditch, through 300′ of 15″ pipe. There are a No. 3 giant and 300′ of 30″ sluices on the claim. The bank is 80′ high, and shows 15′ of gravel. L. B. Courts et al., of Scott Bar, owners.

Crapo Mine (Hydraulic).—See our XIIth Report, pp. 280 and 282. This lies 3 miles below Forks of Salmon, at 1,140′ elevation, and contains 60 acres. The property embraces three locations: *Crapo No. 1*, *Crapo No. 2*, and *Fort Beyers*. The bank is 60′ high, with 15′ of gravel, and the sluices are 400′ long, set on 6″ grade. A 5′ ditch 3 miles long, built on a 19′ grade, conveys water from Crapo Creek, and 1,500′ of 11″ and 15″ pipe delivers it to two No. 3 giants, under 200′ pressure. Bennett & McLaughlin, of Forks of Salmon, owners.

Crawford Mine (Drift).—See our XIIth Report, p. 280. It is at Scott Bar, at 2,050′ elevation. The claim is worked by drifting in the west bank of Scott River. A. Crawford, of Scott Bar, owner.

Crawley Mine (Porphyry).—This 1½ miles S.W. of Callahan. The vein has been traced by a number of surface holes and a tunnel 40′ long. The material exposed is a much decomposed porphyritic rock, carrying gold in paying quantities. George A. Warder and James R. Sears, of Callahan, owners.

Cronin Mine (Hydraulic).—It lies on the North Fork of Salmon River, 6½ miles W. of Sawyer's Bar, at 2,050′ elevation. Water is collected from two small gulches by a ditch 1¾ miles long. The bank is 15′ high, with 4′ of gravel, and the sluices are 18″x 20″ and 100′ long. P. Cronin, of Sawyer's Bar, owner.

Cummings Mine (Quartz).—See our XIIth Report, p. 280. It is on Boulder Creek, 3½ miles S.W. of Callahan, at 4,400′ elevation. The vein is from 1′ to 5′ wide, and carries gold in sulphurets. Idle. Thomas K. Cummings, of Callahan, owner.

Daley Mine (Placer).—It is in Eddy Gulch, 1½ miles S. of Sawyer's Bar, at 2,640′ elevation, and is worked by ground-sluicing. Hugh Daley, of Sawyer's Bar, owner.

David Ledge Mine (Quartz).—This is at the head of Barkhouse Creek, 13 miles N.E. of Scott Bar, at 3,100′ elevation. In a 100′ tunnel an 8″ quartz vein is exposed, lying between porphyry walls, and dipping 45° S.E. Idle. P. C. Lange, of Oak Bar, owner.

Davis Mine (Quartz).—See Hiyou.

Deer Lodge Mine (Quartz).—It lies in White's Gulch, 6 miles S. of Sawyer's Bar, at 4,050′ elevation. The vein is 6″ thick. The developments consits of two tunnels, 75′ and 80′ long. Smith & Eveleth, of Sawyer's Bar, owners.

Deep Bank Mine (Hydraulic).—It is on the South Fork of Salmon River, 23 miles from Trinity Center, at 4,800′ elevation, and contains two locations: one of 20 acres and the other 60 acres. The bank is 200′ high, and gravel throughout. The water for piping is obtained from South Fork of Salmon River, through a 2-mile ditch and flume, largely the latter, which is 2′x 2′ with 1″ grade per 12′, carrying 500 miner's inches, delivered under 300′ pressure through 500′ of 11″ pipe to a No. 2 giant. The water season lasts six months. Bank-water is obtained direct from the river through a flume 4′ wide, 3′ deep, and with 1″ grade to 12′. The tail-flume contains 15 boxes, 40″ wide, set on an 8″ grade. The gravel is loose, and carries gold from top to bottom, both fine and coarse. Two acres of the ground have been washed off; the dump is into the South Fork of Salmon River. F. J. Abrams and W. B. Blackburn, of Abrams, Trinity County, owners.

Del Monte Mine (Quartz).—See Nelson.

Del Norte Mine (Hydraulic).—See our XIIth Report, p. 280. This is on Klamath River, 1½ miles above Happy Camp, at 1,385′ elevation. The 6′x 3′ ditch, 10 miles long, was greatly damaged by heavy snow during 1890, and has not been repaired. The plant of the mine consists of 3,000′ of 11″, 15″, and 20″ pipe and one No. 2 and two No. 3 giants; 180′ pressure is available, and the bank is 35′ high, with 10′ of gravel. Pierson Bros., of San Francisco, owners.

Deming & Gardner Mine.—See Gardner & Deming.

Dillon Hill Mine (Hydraulic).—See our XIIth Report, p. 281. It lies on Klamath River, 4 miles below Cottage Grove, at 1,000′ elevation. The bank is 50′ high, with 15′ of gravel; the sluices are 22″ wide and lined with block riffles. There is 1,000′ of 11″ pipe in use, and two No. 2 giants under 200′ pressure. The ditch is 2½′ wide and 5 miles long, and takes water from Dillon Creek. Dillon Hill Mining Co. (Chinese coöperative), of Cottage Grove, owners.

Doggett Mine (Hydraulic).—It is 2½ miles above Oak Bar, on Klamath River, at 1,965′ elevation. Water is taken from Daggett Creek by a 2′ ditch 1 mile long, and 150′ of 10″ pipe. The bank is 50′ high, with 20′ of gravel, and there is a No. 1 giant under 80′ pressure. There are 800′ of 24″ sluices, paved with Hungarian and block riffles, on a 7″ grade. Louis Doggett, of Oak Bar, owner.

Dominick Lunn (Placer).—It is on the Klamath River, in the neighborhood of Gottville. Idle.

Donovan Mine (Placer).—This is on Grouse Creek, 5¾ miles E. of Callahan, at 4,025′ elevation, and contains 20 acres. Worked by ground-sluicing. D. Donovan, of Callahan, owner.

Doolittle Mine (Hydraulic).—See Haley.

Doolittle Mine (Placer).—It lies on Horse Creek, 15½ miles N.W. of Oak Bar, and contains 20 acres, at 2,290′ elevation. It is worked by ground-sluicing. Walter Doolittle, of Oak Bar, owner.

Double Eagle Mine (Quartz).—It is at the head of Barkhouse Creek, 13 miles N.E. of Scott River, at 2,860′ elevation. The vein is 12″ thick, and dips 45° S.E. between porphyry walls. There is an inclined shaft, 30′ deep on the ledge. Henry Barton et al., of Oak Bar, owners.

Dougherty Mine (Hydraulic).—See our XIIth Report, p. 281. It lies on the North Fork of Salmon River, 4½ miles above Forks of Salmon, The bank is 30′ high and all gravel, and the 2′ ditch is 1½ miles long, taking water out of Big Creek. There is 600′ of 8″ pipe and a No. 1 giant on the claim. Dougherty Bros., of Sawyer's Bar, owners.

Douglass Mine (Hydraulic).—This is on Klamath River, 14 miles below Happy Camp, at 1,140′ elevation, and contains 20 acres. The small ditch is 1 mile long, and 500′ of 11″ pipe and a No. 2 giant, under 150′ pressure, are used. The bank is 12′ high and all gravel. J. W. Douglass, of Happy Camp, owner.

Duncan Mine (Drift).—See our XIIth Report, p. 281. This is on Mill Creek, 5 miles E. of Scott Bar, at 2,550′ elevation. Worked by drifting under the bed of Mill Creek. John Duncan, of Scott Bar, owner.

Dundee Mine (Quartz).—It is on North Fork of Humbug Creek, 14 miles N.W. of Yreka, at 4,000′ elevation. The vein, 6′ wide, trends N. and S., and dips 45° E., in porphyritic rock. A 370′ tunnel on the vein and a 60′ winze are the developments. Idle. C. C. Humphreys et al., of Yreka, owners.

Duzel Mine (Placer).—It lies on Little Humbug Creek, 5 miles E. of Walker, at 2,540′ elevation. Worked by ground-sluicing. Peter Knudson et al., of Walker, owners.

East Fork Ledge Mine (Quartz).—It lies on East Fork, 5 miles E. of Callahan. A shaft 15′ deep, and an open cut 10′ long, expose decomposed auriferous rock. Welker & Schneider, of Callahan, owners.

Eastlick Bros. Mine (Hydraulic).—See our XIIth Report, p. 281. This lies at Oro Fino, at 2,925′ elevation, and contains 60 acres. Water is conveyed to the mine by two ditches. The *Eastlick Lower* ditch takes water from Kidder Creek, and is 4½ miles long, 6′ wide, and 3′ deep. The *Eastlick Bros.* ditch is 7 miles long, 4′ wide, and 3′ deep. Both have a 13′ grade. The combined capacity is about 3,000 miner's inches. The bank, 35′ high, with 20′ of gravel, is being piped away by two No. 1 giants, under 300′ pressure. The sluices are 24″ wide, set on a 3½″ grade, and have block riffles. The gravel after leaving the sluices is raised by a hydraulic elevator some 30′ to the surface, whence it flows to the waste dump through a 5′ flume, 2,000′ long; 2,500′ of 6″, 8″, and 15″ pipe is in use in the mine. The gold is fine, and lies mostly on the slate bedrock. The mine runs night and day, light being furnished by a small, 5 H.P. electric plant run by water-power. The season lasts from four to five months, and during that time nearly an acre of bedrock is cleaned up. Eastlick Bros., of Oro Fino, owners.

E. D. M. Mine (Quartz).—See Saint Lawrence.

Eli Mine (Quartz).—It is 4½ miles W. of Yreka, and comprises three full claims on a N.E. vein, with an average width of 3½′ of an ochery ore, dipping about 50° S.E. between slate foot-wall and porphyry hanging-wall. The developments consist of a 250′ tunnel on the vein and a 50′ winze; exposing a vein from 2′ to 6′ wide. A second tunnel, 500′ lower, is 120′ long, and cross-cuts the vein 6′ without reaching the wall. The ground is heavy, requiring solid timbering; the quartz carries about ½% of sulphurets, mostly iron. A water-right of 200 inches near the forks of the creek, for the mill site, gives 20′ pressure with 900′ of ditch and 250′ of flume. Three men are at work. O. H. Lawson, of Yreka, owner.

Elk Creek Bar Mine (River).—See our XIIth Report, p. 281. This lies on Klamath River, ½ mile below Happy Camp, at 1,300′ elevation.

It is an old bar in the river. The upper part of the gravel is piped off, and the rest is raised by derrick to the sluices. The bedrock is black slate, and lies 10′ below low-water level. An overshot wheel, 24′ in diameter, runs the derrick, and another one, 9′ in diameter, furnishes power for the pump. The latter is of the Chinese pattern, 18″ wide and 6″ deep; the belt is rubber and the cups are wood. A 3′x 2′ ditch, 1½ miles long, furnishes water for power and for a No. 2 giant, and 500′ of 11″ pipe, with a pressure of 40′, is made use of. Mann Co. (Chinese coöperative), of Happy Camp, owner.

Elliott Diggings Mine (Hydraulic).—See our XIIth Report, p. 281. It is on Klamath River, 1½ miles above Cottage Grove, at 1,110′ elevation, and contains 80 acres. Water is taken from Swelip Creek through a 2½′ ditch, 2½ miles long; 750′ of 11″ pipe, and a No. 2 giant under 200′ pressure, are used, although 500′ pressure may be had if desired. The sluices are 22″ wide, have block riffles, and an 8″ grade. The bank is 200′ high, and has 30′ of gravel on the slate bedrock. Elliott Bros., of Cottage Grove, owners.

Empire Mine (Quartz).—See our XIIth Report, p. 281. It is at the mouth of Empire Creek, 2 miles N. of Gottville, at 2,500′ elevation. There are six locations in the claim, with two veins running N.E. and S.W. and E. and W., respectively. The country rock is serpentine and slate. The larger of the two veins is 4′ in width and of low grade. There are four tunnels, 400′, 130′, 260′, and 100′ in length, and three shafts—one vertical, 90′, and two inclines, 200′ and 50′, respectively. A 5-stamp mill (idle) is driven by water-power, derived from Empire Creek, through a short ditch, giving 125′ fall on a 3′ Pelton wheel. Eleven men are employed. C. Yunker, of Yreka, owner.

Enterprise Mine (Hydraulic).—This lies on Wildcat Creek, 5 miles W. of Callahan, at 3,980′ elevation, and contains 1,600 acres. After lying idle for some time they were, in 1895, getting the mine in shape to work on a large scale. The 5-mile ditch, which takes water from Grizzly Gulch, has been cleaned out, and 2,500′ of 15″ pipe and a No. 5 giant are on the ground. The gravel bank is 100′ high, and 350′ pressure is available. Fred Beaudry, of Callahan, owner.

Espey Mining Co.'s Mine (Hydraulic).—It is 4 miles N. of Yreka, at 2,500′ elevation, and consists of several claims flanking the Yreka Flats that have not hitherto been worked, on account of the great expense of bringing in water. The total area to be worked is 200 acres. Water has been obtained by extending the canal of the electric light works, which is taken out of Shasta River near Yreka, until a fall of 32′ was obtained, which was applied on two Knight wheels, 4′ 8″ in diameter, through two 44″ pipes supplied with nine 4″ to 6″ nozzles. The wheels make 93 revolutions per minute and develop 229 H.P., with which the water is raised 432′ by means of a Pittsburg hydraulic pump. The canal starts from the Shasta River with a width of 24′, but narrows down to 14′, and on the Espey portion, which is ½ mile long, to 12′ with a depth of 4′, and a grade of ⅝″ to the rod. The entire capacity of the canal is 8,000 inches of water, the Espey Co. taking 5,500 inches. The intake pipe of the pump is 14″ in diameter and the discharge pipe 12″. The pump is supplied with 6 valves to every cushion; has a 2′ stroke and sustains a pressure of 9.08 tons on the 15″ plunger. The water is delivered into a 16″x 18″ flume, ¾ mile long, with the same grade as the canal. From 150 to 165 inches of water are thus delivered to the top of the hill. In the gravel-cut the water is delivered under 165′ head. The foundations of the pump are on bedrock 6′ below the river-level, and are, altogether, 11′ thick. The water-pipes are ½″ thick, and weigh 1,250 lbs. per joint. The gravel bank is from 12′ to 35′ high, with free gravel, containing coarse black gold throughout. Ten men were employed getting the plant ready for washing. One quarter of a mile of 2′x 16″ tail-flume, with slat riffles, will be used. An incorporated company, of Yreka, owner.

Evening Star Mine (Quartz).—It is at the head of Eddy Gulch, 7 miles E. of Sawyer's Bar. Idle. John Daggett, of San Francisco, owner.

Everill Mine (Drift).—See our XIIth Report, p. 281. This is on Klamath River, 4 miles below Hamburg Bar, at 1,710′ elevation. The claim is worked by drifting in the second bench. John H. Everill, of Hamburg Bar, owner.

Excelsior Mine (Hydraulic).—See our XIIth Report, p. 281. Worked out and abandoned.

Extension of Siskiyou Mine (Quartz).—See Great Northern.

Fabricius & Rider Mine (Hydraulic).—See our XIIth Report, p. 291. It is situated on Little Humbug Creek, 4 miles S. of Walker, at 2,100′ elevation, and contains 40 acres on a former bench of the creek. The gravel is tight, requiring the use of powder. The cut is 30′ deep, 60′ wide, and 150′ long. The gold is coarse and found principally near the granitic bedrock. Fifty inches of water for piping is taken from Little Humbug Creek and its north fork through 2 miles of ditch and delivered, under 80′ pressure, through 300′ of pipe. There are 200′ of 10″x 12″ sluices, lined with pole riffles. Two men are at work. Fabricius & Rider, of Walker, owners.

Fagundez Mine (Quartz).—See Ampback.

Fagundez Mine (Placer).—See our XIth and XIIth Reports, pp. 432 and 281. It is on McAdams Creek, 11 miles N. of Fort Jones, and embraces about a mile of creek bed, 300′ to 400′ wide. The gravel is from 15′ to 35′ deep, and contains many large bowlders. They are hoisted out by a derrick driven by an overshot wheel. The sluices are 30″ wide and paved with block riffles. The water season lasts from about February 15th to July 15th. The mine is said to be the richest in that part of the country. Manuel Lial et al., of Yreka, owners.

Fair Mine (Placer).—It lies on the ridge between the main Wild Cat Creek and South Fork, 5½ miles W. of Callahan, and contains 80 acres. Water is brought from South Fork by a mile of 2′x 2′ ditch and 1,100′ of 8″ siphon pipe; 400′ of 30″ sluices is used. There is no pressure. J. D. Heard et al., of Callahan, owners.

Falcon Mine (Quartz).—It is on the North Fork of Humbug Creek, 11 miles N.W. of Yreka, at 3,400′ elevation. The vein is 9″ wide, trends N.W. and S.E., and dips vertically in a granitic formation. A 4′x 6′ shaft is 25′ deep. A cross-cut tunnel is being driven to cut the vein at 75′ depth. Two men are employed. T. E. Williams, of Yreka, owner.

Finley Mine (Hydraulic).—See our XIIth Report, p. 282. It is at the mouth of Eddy Gulch, 1 mile S. of Sawyer's Bar, at 2,550′ elevation. The property embraces the following three locations: *Clapboard*, *Gold Nugget*, and *Slapjack*. Water is furnished by two flumes; the one from Eddy Creek is 1¼ miles long, 2½′ wide by 1½′ deep, and has a grade of 12.8′ per mile; the other, 1 mile long, is 3′ wide by 14″ deep, and has a grade of 9.6′ per mile. They deliver the water under 200′ and

80′ pressure, respectively; 600′ of 12″ pipe and two No. 1 giants are used. The sluices are 30″ wide and have a grade of 9″ per box. S. L. Finley & Sons, of Sawyer's Bar, owners.

Flag Mine (Quartz).—It is on Sucker Creek, at 3,600′ elevation. The vein is 30″ wide, courses N. and S., and dips about 80° E., in granodiorite. It is being prospected by open cuts, by two men. — McIntyre, of Yreka, owner.

Foley Mine (Hydraulic).—See our XIIth Report, p. 282. This is on the North Fork of Wildcat Creek, 5½ miles W. of Callahan, at 4,020′ elevation. Water is taken from Wildcat Creek by a 2′x 2′ ditch, 1½ miles long. The bank is 25′ high, and is all gravel; the sluices are 24″ wide; 1,500′ of 8″ and 11″ pipe and a No. 1 giant, under 200′ pressure, are used. G. H. Hayes, of Callahan, owner.

Forks (McNeals') Mine (Hydraulic).—See our XIIth Report, p. 287. It is at Forks of Salmon, at 1,325′ elevation, and contains 50 acres. The ditch, taking water from McNeal Creek, is 1 mile long and 3′ wide, and has a grade of 19.2′ per mile. The sluices are 36″x 32″ and paved with blocks; the bank is 30′ high, and all gravel. There are 1,000′ of 11″ and 15″ pipe on the claim and two No. 2 giants, working under 200′ pressure. W. P. Bennett, of Forks of Salmon, owner.

Fort Beyers Mine (Hydraulic).—See Crapo.

Fort Gough Mine (Hydraulic).—See our XIIth Report, p. 282. It is on Klamath River, 5 miles below Seiad, at 1,600′ elevation. The 3′ ditch, taking water from Gough Creek, is 1½ miles long. The bank is 100′ high, with 30′ of gravel. The sluices are 28″ wide and 600′ long; 3,000′ of 11″ pipe delivers the water to a No. 2 giant, under 140′ pressure. Large rocks are removed by a water-power derrick. Dean & Burns, of San Francisco, owners.

Fort Jones Mine (River).—It is 1 mile below Gottville, at 2,000′ approximate elevation, and is a river wing-dam claim worked by Chinese, with the use of four wheels; one for pumping, one for hoisting, and two dip-wheels. A derrick, with a 70′ boom and driven by water-power, is used. There are 150′ of sluices on an 8″ grade, paved with wooden blocks. A Chinese company, of Gottville, owner.

Fortune Mine (Hydraulic).—See our XIIth Report, p. 282. Abandoned.

Fouch Mine (Hydraulic).—See Scott River.

Frank Mine (Placer).—It is at the mouth of Eddy Creek, 1¼ miles S. of Sawyer's Bar, at 2,520′ elevation. It contains 10 acres. Idle. Manuel Fischer, of Redding, Shasta County, owner.

Franks & Moncton Mine (Quartz).—See Osceola.

Frank Perry Mine (Placer).—It is about ½ mile N.E. of Hawkinsville, adjoining the Espey Mine, at 2,200′ elevation, and contains 20 acres. Under the present conditions only 6′ to 8′ of bank can be worked by ground-sluicing, on account of the lack of grade; 6′ of gravel has not been bottomed, and will have to be elevated. Water is obtained from the Espey Mine; the tailings dump into Yreka Creek. Two men are employed. Manuel Dutra and Frank Perry, of Hawkinsville, owners.

Frazer Mine (Placer).—It lies on Eddy Gulch, 3¾ miles S. of Sawyer's Bar. Worked by ground-sluicing. Joe Frazer, of Sawyer's Bar, owner.

Galena Mine (Quartz).—It is situated on the divide between Sucker Creek and the Middle Fork of the Humbug, 12 miles N.W. from Yreka. The vein trends N. and S., and dips 35° E., in porphyry and limestone formation. A 100′ tunnel has been driven on the vein, and the ground above stoped to the surface. Two men are at work. J. N. Coulson and A. E. Thrash, of Yreka, owners.

Gardner & Deming Mine (Hydraulic).—It is at Oro Fino, at 3,130′ elevation, and contains 31 acres of gravel, 20′ deep. Water is taken from Kidder Creek by a ditch 11¼ miles long, 3½′ wide, and 18″ deep, which crosses the Muggsville Divide by a 22″ inverted siphon, 1,900′ long and under 200′ pressure. About 1,000 inches of water is delivered to a No. 2 giant, under 240′ pressure, through 1,400′ of 8″ pipe. The sluices are 600′ long and 24″ wide, paved with block riffles, and have a grade of 5″ per box. Large lanterns are used at night. S. R. Gardner et al., of Oro Fino, owners.

Gardner & Deming Mine (Quartz).—It is ½ mile N.W. of Oro Fino. S. R. Gardner et al., of Oro Fino, owners.

Gausney Mine (Placer).—This is on Klamath River, 2½ miles below Oak Bar, at 1,870′ elevation. Idle. J. Gausney, of Oak Bar, owner.

Gee Wah Mine (Drift).—See Hardscrabble.

Gerhart Mine (Hydraulic).—See our XIIth Report, p. 282. It lies on Horse Creek, 12 miles N.W. of Oak Bar, at 2,080′ elevation, and contains 40 acres. A 1½″ nozzle on 150′ of 6″ hose is supplied with water, from Fish Gulch, by a 2′ ditch, ¾ of a mile long. The bank is 12′ high, and all gravel; the sluices are 100′ long, 12″ wide, and have Hungarian riffles. J. Gerhart, of Oak Bar, owner.

Gerkin Mine (Placer).—This lies on the South Fork of Salmon River, 7 miles below Cecilville. It is worked by ground-sluicing, water being taken from Butcher Gulch. George Gerkin, of Cecilville, owner.

Gibson Bar Mine (Placer).—It is on the Klamath River in the vicinity of Gottville. Idle.

G. Knichts' Mine (Placer).—See Kee Hong.

Golden & Eveleth's (*Brown Bear*) *Mine* (Quartz).—See our XIIth Report, p. 283. It lies on Eddy Ridge, 6 miles S.E. of Sawyer's Bar, at 4,700′ elevation. The vein averages 4′ in thickness; lies between porphyry and slate, and dips 45° to 70° N. The mine is worked through two tunnels, 165′ and 450′ long, connected by a winze. The ore-shoot is 175′ long, and the ore contains about 1% of sulphurets. A 4-stamp water-power mill belongs to the claim; the stamps weigh 750 lbs. and drop 7″, 90 times per minute. Power is obtained from a 6′ hurdy wheel under 165′ pressure. Frank Golden et al., of Sawyer's Bar, owners.

Golden Ball Mine (Quartz).—See our XIIth Report, p. 282. It is at the head of Eddy Gulch, 5 miles S. of Sawyer's Bar, at 4,300′ elevation. The vein of ribbon quartz averages 4′ and lies between slate walls, and dips 150° E. The mine is worked through four tunnels, each from 400′ to 600′ long, which are driven on the vein, 80′ to 120′ apart. An old 20-stamp mill belonging to the mine is nearly worn out, and is to be replaced by a new one in the near future. Golden Ball Mining Co., owner; A. Ball, of Sawyer's Bar, superintendent.

Gold Note Mine (River).—It is situated in the Klamath River, 6 miles W. of Henley, at 2,100′ approximate elevation, and comprises 1,500′ along the course of the river. A wing-dam, 100′ and over in length, with end dams of about the same length, make a bank of 100′ available, with 20′ gravel next the bedrock. Two river wheels, 14′x 15′ and 16′x 15′, furnish the power for pumping and hoisting, while a small wheel, run by the seepage water, drains the depression in the bedrock. The gravel is free, and two drifters take out 12½ tons per shift (25 tubs of 1,000 lbs. each). The gravel last season yielded an average of 75 cents of coarse gold per cubic yard, by washing through 100′ of 16″ sluices set on a ½″ grade. The water-power derrick has a sweep of 75′ and a lifting capacity of several tons. Four men are employed. D. Horn, of Hornbrook, owner.

Gold Nugget Mine (Hydraulic).—See Finley.

Gold Run Mine (Quartz).—See Hungry Hill.

Goodenough Mine (Quartz).—It lies at the head of Barkhouse Creek, 13 miles N.E. of Scott Bar, at 3,210′ elevation. There are two tunnels on the claim, 50′ and 96′ long, and a winze 20′ deep. The vein is 6′ to 9′ wide, and dips 83° E. An arrastra is used to reduce the quartz. C. E. Humphrey et al., of Scott Bar, owners.

Goodenough Mine (Quartz).—See Spencer.

Goodwin Mine (Hydraulic).—It is on Klamath River, 11 miles below Cottage Grove, and contains 120 acres, lying at 920′ elevation. Water is taken from Sandy Bar Creek by a 2′ ditch 3 miles long; 300′ of 8″ pipe and a No. 1 giant, under 100′ pressure, are used. The bank is 40′ high, with 10′ of gravel. The sluices are 24″ wide. Frank Goodwin et al., of Cottage Grove, owners.

Gordon Mine (Hydraulic).—See our XIIth Report, p. 283. It is on Klamath River, 5½ miles above Happy Camp, at 1,440′ elevation. The bank is 30′ high, and all gravel; the sluices are 24″ wide and have a grade of 6″ per box; 2,500′ of 11″ pipe and a No. 2 giant are in use. The ditch from Horse Creek is 2½′ wide by 2′ deep, and 3 miles long—nearly all flume. A water-power sawmill is on the claim. C. Gordon, of Happy Camp, owner.

Grattan Mine (Quartz).—See Last Chance.

Great Northern (*Extension of Siskiyou*) *Mine* (Quartz).—It is on the Middle Fork of Humbug Creek, 6½ miles N.W. from Yreka, at 2,900′ elevation. The vein averages 2′ in width, trends N. and S., and dips 50° E., between porphyry walls. The only development on this idle mine is a 6′x 10′ double-compartment shaft, 40′ deep. F. Kelly, A. Raines, D. McCook, and J. J. Ferrier, of Yreka, owners.

Green Mountain Mine (Quartz).—This is in Hull Gulch, a tributary of Quartz Valley, at 3,220′ elevation. The vein is 12″ thick, lies between porphyry and diorite, and dips 60° S.E. The mine is worked through a cross-cut tunnel 1,000′ long, and a winze 200′ deep. Power drills are used. At the mouth of the tunnel are an air-compressor and a 5-stamp mill. Howard Lewis, of Fort Jones, superintendent.

Grider Mine (Hydraulic).—This is on Klamath River, 2 miles below Happy Camp, and contains 160 acres, lying at 1,350′ elevation. Water is taken from Grider Creek through a ditch 2 miles long and 6′ wide; 3,000′ of 15″ and 20″ pipe is used. The bank is 60′ high, with 10′ of gravel. One No. 1, two No. 2, and one No. 3 giant are used, under 100′ pressure. The sluices are 24″ wide, and have a grade of 4½″ per box. A Chinese coöperative company, owner; Ah Ock, of Happy Camp, manager.

Grider Mine (Hydraulic).—It lies on Klamath River, 1 mile above Seiad, at 1,720′ elevation. The ditch is 4½′ wide by 2′ deep, is 4½ miles long, and has a grade of 12.8′ per mile; 1,600′ of 11″ to 20″ pipe and a No. 3 giant, under 100′ pressure, are used. The bank is 90′ high, with 25′ of gravel; the sluices are 250′ long and 24″ wide, and have a grade of 6″ per box. W. T. Grider, of Seiad, owner.

Gum Boot Mine (Quartz).—This is at the head of Mill Creek, 9 miles E. of Scott Bar, at 4,400′ elevation. The vein is from 4′ to 6½′ thick, lies between walls of blue slate, and dips 40° S.W. The developments consist of an incline shaft 35′ deep and a tunnel 80′ long. A sled-road is under construction to connect the mine with the wagon-road. The ore contains some sulphurets, galena, and chalcopyrite. C. E. Humphrey et al., of Scott Bar, owners.

Hadloff Mine (Quartz).—It lies at the head of Barkhouse Creek, 13 miles N.E. of Scott Bar, at 3,150′ elevation. There is an incline shaft 35′ deep and a tunnel 15′ long. The vein is 2′ thick and dips 45° E. C. E. Humphrey, of Scott Bar, owner.

Haley Mine (Hydraulic).—It is on Klamath River, 10 miles below Happy Camp, and contains 40 acres, lying at 1,540′ elevation. Water is conveyed from Daggett Creek by a 2½′ ditch, 3 miles long, and delivered through 400′ of 11″ pipe to a No. 2 giant acting against a 30′ gravel bank, under 175′ pressure. The sluices are 20″ wide, have an 8″ grade, and are paved with block riffles. M. Doolittle, of Happy Camp, owner.

Halstead Mine (Hydraulic).—It is on Klamath River, 10 miles below Happy Camp, at 1,530′ elevation. It adjoins the Haley Mine and is worked by the same plant. M. Doolittle, of Happy Camp, owner.

Halvorson Mine (Hydraulic).—This is on both sides of Klamath River, 17 miles below Cottage Grove, and contains 180 acres, lying at 860′ elevation. On the *left* bank, water is brought from Irvin Creek by a ditch 4′ wide and ½ mile long; 500′ of 8″ and 11″ pipe and a No. 1 and a No. 2 giant, under 65′ pressure, are used. The bank is 20′ high, with 7′ of gravel, and the sluices are 24″ wide. On the *right* bank, water is taken from Haywood Creek through a 2½′x 2′ flume, 1¼ miles long. A No. 1 giant, under 160′ pressure, and 1,000′ of 8″ and 11″ pipe are used. The gravel bank is 30′ high and the sluices 20″ wide. A. Halvorson, of Cottage Grove, owner.

H. & M. Mine (Hydraulic).—It is on the South Fork of Scott River, 2 miles S.W. of Callahan, at 3,625′ elevation. It lies on the second bench, 50′ above the river. The bank is 75′ high, with 25′ of gravel, and rests on slate bedrock. The ditch is 3 miles long, 2′ wide, and has a grade of 25.6′ per mile. The water is conveyed to the No. 2 giant under 240′ pressure, through 700′ of 8″ pipe. Welker Bros. & Barr, of Callahan, owners.

Hanson Mine (Placer).—See our XIIth Report, p. 284. It lies 4 miles above Somes Bar, on Salmon River, and is worked by ground-sluicing. W. H. Bowersox, of Somes Bar, owner.

Hardscrable Mine (Drift).—This lies on McAdams Creek, 4½ miles above Fort Jones. This mine was supposed to be worked out, and abandoned in 1885. Since then a Chinese company has taken hold of the property, and seems to be doing well. Its outlet is through the Oak Grove Mine adjoining, and pumps are unnecessary. Gee Wah Co., of Etna, owner.

Hardscrabble Mine (Drift).—This is on Mill Creek, a tributary of Quartz Valley. Idle. E. Erno, of Oro Fino, owner.

Harris Mine (Hydraulic).—Sold to and included in the Salmon River Mine.

Hart Mine (Placer).—See our XIIth Report, p. 284. It lies on Craigo Gulch, 6 miles W. of Callahan, and is worked by ground-sluicing. Charles Hart, of Callahan, owner.

Hartstan Mine (Quartz).—This is on French Creek, 7 miles S. of Etna. The improvements consist of two tunnels, 300′ and 400′ long, and a 5-stamp water-power mill. The vein is 2′ thick. Idle. George W. Hartstan, of Etna, owner.

Hayslip Gulch Mine (Placer).—It lies on the East Fork of Scott River, 4 miles E. of Callahan, and embraces 20 acres. A ditch 4 miles long and 2′ wide brings water from Grouse Creek. Worked by ground-sluicing. L. Schneider, of Callahan, owner.

Heard & Henry Mine (Placer).—It is on Smith's Gulch, 3½ miles S.W. of Callahan. After lying idle for some years, the claim is being refitted with a plant for ground-sluicing. M. W. Loveridge, of Callahan, owner.

Hegler Mine (Quartz).—It is on Lawson's Gulch, 12 miles N.W. from Yreka, at 3,800′ elevation. The vein varies from 6″ to 6½′ in width, courses N.E. and S.W., and dips about 70° E., between slate and porphyry walls. It has been opened by three tunnels about 80′ apart; the lowest one is a cross-cut 180′ long, with 720′ of drifts on the vein; the other two are driven 300′ and 100′, respectively, on the vein. The ore-shoots pitch to the S.E. The ore is reduced in a 5-stamp steam-mill, with 600-lb. stamps, run by an 8 H.P. engine, crushing 1 ton per stamp per day, when dropping 5½″, 100 times per minute, and discharging through a No. 8 slot screen. The aprons are set on a grade of 1½″ per foot; the sluice-plates at 1¼″. Four men are employed. Hegler & Aldrich, of Yreka, owners.

Hibernia Mine (Quartz).—See Ninety.

Hickey Mine (Hydraulic).—It is on North Fork River, 6 miles below Sawyer's Bar, at 2,100′ elevation, and contains 20 acres. Water is taken from small gulches by a ditch 1¼ miles long, and delivered through 500′ of 15″ pipe to a No. 2 giant, under 200′ pressure. The claim lies on the second bench, and is supplied with 200′ of 24″x 24″ sluices. Frank Hickey, of Sawyer's Bar, owner.

Hickey Bros.' Mine (Hydraulic).—See our XIIth Report, p. 284. It lies on North Fork River, 2½ miles below Sawyer's Bar, at 2,275′ elevation. About 1¼ acres were cleaned up during the season of 1894–95. Hickey Bros., of Sawyer's Bar, owners.

Hickox Mine (Hydraulic).—It is on Klamath River, 15 miles below Cottage Grove, at 900′ elevation. The bank is 30′ high, and the gravel 10′; the sluices are 24″ wide, and paved with block riffles. A No. 1 giant, under 50′ pressure, is supplied by 150′ of 8″ pipe. Water is brought from Sandy Bar Creek by 2½ miles of 2′ ditch. Charles Hickox, of Cottage Grove, owner.

Hidden Treasure Mine (Quartz).—See Claughry.

Highland Mine (Quartz).—This lies on Trail Creek, 14 miles S.W. of Callahan, and is developed by a tunnel 200′ long and a shaft 100′ deep. The vein is 4′ thick and dips 45° N.W. A 2-stamp water-power mill is on the premises. J. B. Fort et al., of Callahan, owners.

Hiyou (Davis) Mine (Quartz).—It is on the hill ½ mile N.W. from Deadwood. The vein averages 12″ in thickness, and the ore shows specks of zinc-blende, galena, and pyrite. The developments consist of three tunnels, 70′, 80′, and 240′ long, respectively, which are connected by winzes for air. The ore is sledded down the hill to an arrastra in Deadwood Gulch, which is driven by a 20′ overshot wheel.

Hiyou Gulch Mine (Hydraulic).—This lies at the mouth of Hiyou Gulch, 9 miles N. of Fort Jones. The ditch is partly destroyed, and the mine is idle. Estate of Mrs. Noah Williams, of Callahan, owner.

Hoboken Mine (Quartz).—See our XIIth Report, p. 284. It lies on Cherry Creek, 11 miles N. of Fort Jones, at 4,500′ elevation. The vein is a dark-colored ribbon quartz, from 6″ to 6′ thick, and dips about 35° N.W. The mine is developed by three cross-cut tunnels and drifts; No. 1 is 67′ long, and drifts 500′ long on the vein. All the ore above this level is stoped. Tunnel No. 2 is 500′ long, and is 290′ lower than No. 1 tunnel. When the vein was struck, water came in in such quantities that work was suspended. Tunnel No. 3 was then started 100′ lower down to drain the mine, and is about 100′ long. Idle. Henry J. Diggles, of Fort Jones, owner.

Hock Mine (Drift).—This is on Indian Creek, 5 miles N. of Fort Jones, at 3,100′ elevation. The claim contains 20 acres, and is being drifted from the bottom of a 3½′x 4′ shaft, 60′ deep. The gravel is hoisted by horse-whim. Hock Co. (Chinese coöperative), of Fort Jones, owner.

Hock Him Mine (Drift).—It lies on Indian Creek, 4 miles N. of Fort Jones, at 3,000′ elevation. The bedrock lies 65′ below the surface. The mine embraces 20 acres, and is worked in the same manner as the Hock Mine, which it adjoins. Hock Him Co. (Chinese coöperative), of Fort Jones, owner.

Horn (*Bennett*) *Mine* (Hydraulic).—This is at the Forks of Salmon River, and contains 40 acres, lying at 1,325′ elevation. The bank is 40′ high, and has 15′ of gravel. Water for ground-sluicing is taken from Horn Gulch by a ditch ½ mile long. W. P. Bennett, of Forks of Salmon, owner.

Horse Creek Mine (Hydraulic).—This lies on Horse Creek, 11 miles N.W. of Oak Bar, at 2,140′ elevation, and contains 310 acres, including the old *Bret*, *Lacy*, and *Barton* claims. The company has lately been organized, and the plant will be ready to work during the season of 1895–96. The ditch, taking water from a branch of Horse Creek, is 3′ wide by 2′ deep, and 4½ miles long, with a grade of 6.4′ per mile. The bank is from 20′ to 100′ high, and all gravel. Water is delivered through 600′ of 11″ pipe to a No. 2 giant, under 225′ pressure; the sluices are 36″ wide, and are set on a grade of 11″ per box. Horse Creek Mining Co., owner; P. C. Lange, of Oak Bar, superintendent.

Horse Creek Mining Co.'s Mine (Hydraulic).—It is situated on the Klamath River, near Oak Bar, and contains 340 acres of placer ground, on an ancient channel 150′ above the present bed of Horse Creek. This channel is 120′ wide, covered with 10′ of top soil, heavily timbered; the lower 8′, of gravel, resting on the slate bedrock, carries coarse gold. Twelve hundred inches of water is taken from Horse Creek, through 4.1 miles of ditch, and delivered to two giants, with 3″ and 4″ nozzles, under 250′ pressure. The 3′x 3′ tail-flume is 200′ long, paved with 12″ wooden blocks, and set on a grade of 8″ to the box. Twelve men are employed, working in two shifts. P. C. Lange et al., of Yreka, owners.

Hossick & Brown Mine (Quartz).—See Old Vet and Eclipse.

Hourigan Mine (Placer).—This is on Klamath River, ½ mile above Hamburg Bar, at 1,840′ elevation, and is worked by ground-sluicing. M. Hourigan, of Hamburg, owner.

Howard Mine (Placer).—It is on Indian Creek, 12 miles N. of Happy Camp, at 2,250′ elevation. The claim contains 20 acres, and is worked by ground-sluicing. S. E. Howard, of Happy Camp, owner.

Hubbard Mine (River).—See our XIIth Report, p. 285. It lies in the bed of Klamath River, 2 miles above Oak Bar, at 1,950′ elevation. Bedrock lies 10′ below water-level. Two water-wheels, furnishing power for the derrick and the pumps, are driven by the river current. The coffer-dams inclose about ½ acre. Jesse Hubbard, of Oak Bar, owner.

Hubbard Mine (Placer).—It lies on Horse Creek, 14½ miles N.W. of Oak Bar, at 2,250′ elevation. The claim contains 40 acres, and is worked by ground-sluicing. W. H. Hubbard, of Oak Bar, owner.

Huey Mine (Hydraulic).—It is on Indian Creek, 13 miles N. of Happy Camp, at 2,375′ elevation, and contains 40 acres. Water is taken from Mill Creek by a 2′x 2′ ditch, 3 miles long, and delivered through 300′ of 9″ pipe to a No. 2 giant, under 80′ pressure. The bank is decomposed bedrock and 50′ high, and the sluices are 300′ long, 20″ wide, and set on a grade of 8″ per box. D. Huey, of Happy Camp, owner.

Humbug Flume and Mining Co.'s (*Spengler*) *Mine* (Placer and Hydraulic).—See our XIth and XIIth Reports, pp. 441 and 292. This is a bar claim, situated at the mouth of Humbug Creek, 12 miles N.W. from Yreka, at 2,150′ elevation, and comprises two claims; one of 38 acres and one of 15 acres. The gravel bank, from 27′ to 30′ deep, is somewhat cemented, resting on a slate bedrock, next to which are many heavy bowlders. The gold is scattered throughout the wash, though mostly to be found in the 5′ or 6′ next the bottom. Some powder is used to loosen the gravel. A steam derrick, with 60′ mast and 74′ boom, is run by a 15 H.P. engine. The gravel is washed through 40 boxes, 16″x 18″, and set on grades averaging 9″ to the box; these boxes are cleaned up once a week when working top gravel, and twice a week when cleaning bedrock, which is picked up from 2″ to 1′. Eleven men are employed, working one shift. Spengler Bros. et al, of Yreka, owners.

Hungry Hill (*Gold Run*) *Mine* (Quartz).—See our XIth Report, pp. 429–430. It lies on Knownothing Creek, 8 miles S. of Forks of Salmon, at 3,350′ elevation. Since last described, three tunnels have been driven, 100′, 120′, and 300′, respectively, below the old workings. No. 5 is 100′, No. 6 is 480′, and No. 7 is 600′ long. In No. 7, the lowest, both the Hunter vein and the Gold Run vein have been cut. They lie about 200′ apart, run nearly parallel, and dip about 60° S.W. The pay-shoot on the Gold Run is 260′ long and dips W. The ore is a hard white quartz, with 3% of iron, zinc, and lead sulphurets. The old 4-stamp mill is worn out, and a new 10-stamp mill and three Frue vanners are on the ground ready to be put up. Water through a 7″ pipe, acting upon a 3′ Pelton wheel under 850′ pressure, will furnish the power. The wheel will drive also an air-compressor for five power drills. A. Dannenbrink, of Gilta, owner.

Hunter & Downey Mine (Quartz).—See our XIIth Report, p. 285. It is on White's Gulch, 5 miles S. of Sawyer's Bar. Idle. H. Hunter and L. Downey, of Sawyer's Bar, owners.

Huntington Mine (Placer).—This is on Grouse Creek, 5½ miles E. of Callahan, at 3,980′ elevation. It is worked by ground-sluicing. J. Huntington, of Callahan, owner.

Indian Bar (*Ayles & Dunn*) *Mine* (Placer).—See our XIIth Report, p. 277. It lies on South Fork River, 6 miles above Forks of Salmon, at 1,890′ elevation. The claim is worked by ground-sluicing, water being obtained from Indian Creek. Ayles & Dunn, of Gilta, owners.

Indian Creek empties into Scott River some 3 miles below Fort Jones. The bottom of the valley is filled with auriferous gravel, which is mined by the drifting process at the lower end of the creek, and by open placers and hydraulicking above. In the surrounding hills at and above the village of Hooperville, many small quartz lodes are found, and some have been worked with varying success. The country rock is gray porphyry.

Ingham Mine (Hydraulic).—This is on Klamath River, 19 miles below Cottage Grove. It is a new location, and is being put in shape to be ready for piping during the season of 1895–96. Walter Ingham, of Cottage Grove, owner.

Insurance Mine (Quartz).—It lies at the head of Barkhouse Creek, 13 miles N.E. of Scott Bar, at 3,260′ elevation. The vein is 2′ thick and dips 50° W. It is prospected by a tunnel 53′ long. C. E. Humphreys, of Scott Bar, owner.

Ironsides Mine (Quartz).—See our XIIth Report, p. 285. It is on the divide between Greenhorn Gulch and Cherry Creek, 8 miles S.W. from Yreka, at 4,650′ elevation. The vein is 1′ to 2′ wide, trends N. and S., and dips 48° E., between serpentine and hornblende-schist. The outcrop has been exploited through short tunnels and open cuts over a distance of 1,300′, showing the presence of gold throughout. The rock is crushed in a hand-mortar. J. Ironsides, of Yreka, owner.

Itney Mine (Hydraulic).—It lies on Beaver Creek, 15 miles N.E. of Oak Bar. The plant consists of 1,000′ of 8″ pipe, a No. 2 giant, and 600′ of 24″ sluices. The ditch is 2½′ wide by 2′ deep, and 2 miles long; it takes water from Beaver Creek. J. T. Itney, of Oak Bar, owner.

Jackson Mine (Placer).—See our XIIth Report, p. 285. It is on Little Humbug Creek, 4 miles E. of Walker, at 2,295′ elevation. The claim contains 20 acres, and is worked by ground-sluicing. B. B. Jackson, of Walker, owner.

Jacobs & McCarthy Mine (Hydraulic).—This lies on Scott River, 1 mile S. of Scott River, at 2,150′ elevation. Water is obtained from Randall Lake by a short ditch; 300′ of 11″ pipe give 100′ pressure to a No. 1 giant. The gravel bank is 20′ high. The claim lies on the second bench, and contains 40 acres. D. McCarthy et al., of Scott Bar, owners.

Jehovah Mine (Quartz).—It is 2 miles N.W. from Yreka, at 3,000′ elevation. The E. and W. vein dips 70° N., between gneiss and porphyry, and is 2′ to 3′ wide; the quartz is of ribbon structure, and carries 1% sulphurets. The developments consist of a 5′x7′ shaft, 45′ deep on the vein, with a 30′ drift to the W.; 150′ below an adit level is started, and 97′ have been completed. One man is at work. O. H. Lawson, of Yreka, owner.

Joe Francis & Co.'s Mine (Placer).—It is in Hawkinsville, at 2,350′ elevation, and contains 20 acres, with a quarter interest in the Greenhorn ditch. The gravel bank, 10′ to 12′ high, is worked by ground-sluicing. The water season is four months on an average. Joe Francis et al., of Hawkinsville, owners.

Johnson Mine (Quartz).—See our XIIth Report, p. 285. It is in Quartz Valley, S. of Hull Gulch, at 3,480′ elevation. The workings are said to extend 600′ below the surface. The mine lies idle, and the workings are caved. Estate of Richard Johnson, owner; J. Moxley, of Etna, agent.

Johnson Mine (River).—See our XIIth Report, p. 285. This is in the bed of Horse Creek, 16 miles N.W. of Oak Bar, at 2,300′ elevation. Bedrock lies 10′ below water-level. A derrick and a pump-wheel are driven by water-power. W. T. Johnson, of Oak Bar, owner.

Johnny Bull Mine (Drift and Placer).—It lies on McAdams Creek, 5¼ miles N. of Fort Jones. Part of this claim has been drifted, but at present the bedrock is being stripped. A large derrick, with 1″ manilla rope and a 90′ boom, is used to hoist the gravel, which is 20′ to 25′ deep, to the surface. The whole of the material carries gold and is run through the sluices. A steam-engine with 6″x 12″ cylinder furnishes the power. The gravel is handled in flat boxes 3′x 4′x 1′, open on one side, and arranged to dump by pulling a short rope. Hop Sing Co., of Fort Jones, owner.

John Jones Mine (Placer).—It is situated on the North Fork of Humbug Creek, and is worked by 6 Chinese.

John Miller Mine (Placer).—It is 1 mile N. from Hawkinsville, at 2,650′ elevation, and contains 40 acres of patented ground, with a one quarter interest in the Greenhorn ditch. The mine is worked by ground-sluicing, during the four months' water season, and the 10′ to 14′ bank is drifted the remainder of the season. The gold is coarse, and found next the bedrock. The flume is 900′ long, and set on a 4″ grade. Four men are employed. J. A. Tiexeria, of Yreka, owner.

Jordan Mine (Auriferous Trap).—It is 1 mile E. of Summerville, at 3,250′ elevation. The vein matter is a trap rock with pyrite, standing nearly vertically between walls of eruptive granite. A 100′ tunnel has been driven on the vein. Cyrus Jordan, of Cecilville, owner.

Jumbo Mine (Quartz).—See our XIIth Report, p. 285. It lies on White's Gulch, 4½ miles S.E. of Sawyer's Bar, at 3,340′ elevation. The developments consist of three tunnels, 60′, 120′, and 200′ long, all on the vein. The ore is a white quartz, with some sulphurets. In the middle tunnel the vein is 4′ thick, and arrangements have been made to stope. The ore is to be run to the mill through a chute 4′ wide. The mill stands near the creek, has 10 stamps of 750 lbs., No. 9 screens, 12′ of amalgamated plates, and is driven by a 30″ Pelton wheel under 200′ pressure. Dr. H. C. Helm et al., of Sawyer's Bar, owners.

Junction Bar Mine (River).—This is at the mouth of Scott River, 2 miles below Scott Bar, at 1,645′ elevation. A crib-dam in the river 200′ long, and a ditch 3′ wide by 2′ deep and ¾ mile long, furnish water for the sluices and for a large overshot hoisting-wheel. The sluices are 24″ wide, 600′ long, and dump the debris into the Klamath. The claim lies on a bar in Scott River, and bedrock is 10′ below water-level. No pumps are required; 8 shovelers keep a large derrick going. Fang Yick Co., of Scott Bar, owner.

Kanaka Mine (Placer).—It is situated at Gottville, at 1,950′ elevation, and embraces 60 acres; the gravel is about 14′ deep. Idle.

Kaper Mine (Placer).—It is on Eddy Gulch, 1¾ miles S. of Sawyer's Bar, at 2,740′ elevation. The claim contains 10 acres, and is worked by ground-sluicing. J. P. Kaper, of Sawyer's Bar, owner.

Katie May Mine (Quartz).—It lies on Greenhorn Gulch, 6 miles W. of Yreka, at 2,500′ elevation. The vein is 7″ to 19″ wide, trends N. and S., and dips 85° W., between slate and porphyry walls; the slate carries enough lime to cause it to swell. The quartz carries 5% of sulphurets. The ore is hauled 16 miles and crushed in a custom mill. The developments consist of a 60′ shaft and 120′ tunnel, on the vein. Four men are employed. M. Carrick, of Yreka, owner.

Kee Hong (*G. Knichts*) *Mine* (River).—It is situated at the mouth of Humbug Creek, at about 1,900′ elevation, and contains 40 acres. A dip and a pump wheel are used; also a derrick, with 65′ sweep, run by water-power. The cut is 60′ deep, 70′ wide, and 200′ long; the gravel requires blasting, but carries few bowlders. Twenty Chinese are employed. A Chinese company, owner.

Keffer Mine (Drift).—It is on Klamath River, 1½ miles below Oak Bar, at 1,890′ elevation. The claim contains 40 acres, and is worked by drifting in the bank of the river. J. C. Keffer, of Oak Bar, owner.

Kellner, Doescher & Mahr (*Buckhorn, U. S.*) *Mine* (River and Drift).—This is on North Fork River, 2½ miles W. of Sawyer's Bar, at 2,140′ elevation, and contains 40 acres, lying partly in the river-bed and partly on the second bench. The river is turned by a timber dam into an artificial channel ¼ mile long, and the original bed is left dry. Bedrock is 15′ below water-level; two large Chinese pumps and a derrick are driven by overshot wheels, power being obtained through a ditch, 3′ wide and 1 mile long, from the river. The sluices are 14″x 14″, and 500′ long, and are fitted with pole riffles. During high water drifting is carried on in a bank of gravel (second bench), 50′ above the river. G. A. Mahr et al., of Sawyer's Bar, owners.

Kettlewood & Tibbets Mine (Placer).—See our XIIth Report, p. 285. Abandoned.

Kiernan Mine (Quartz).—It is 9 miles S.W. of Edgewood, at 6,000′ elevation. The vein trends N.W., and dips 70° S.W., between granite walls, to which it is frozen. A tunnel to strike the ledge at 70′ depth has cross-cut 170′, and has 35′ to run yet to reach the point. A shaft has been started on the vein. P. Kiernan, of Gazelle, owner.

King Solomon Mine (Quartz).—It is a prospect, on the divide between the Middle Fork of Humbug and Sucker creeks, about 12 miles N.W. from Yreka, at 4,000′ elevation. Idle. Dr. Sounger, of Ashland, Oregon, owner.

Klamath Mine (Quartz).—See our XIth Report, page 432. It lies at the head of Eddy Gulch, 4 miles S. of Sawyer's Bar, at 4,800′ elevation, and comprises three full claims. The quite extensive old workings have lain idle several years, although a large body of low-grade ore is blocked out. The vein is 5′ thick. A tunnel, 65′ long, was driven during 1895. Idle. Golden Ball Mining Co., owner; A. Ball, of Sawyer's Bar, superintendent.

The Klamath River, below the mouth of Scott River, has cut its way through the northern end of the Coast Range and nearly at right angles to its trend. It runs through a rather narrow cañon from a few hundred to several thousand feet in depth, with slopes as steep as the material, whether rock or earth, will stand, and which are clothed with a dense growth of timber and brush. At Hamburg Bar, Happy Camp, Orleans Bar, and a few other places, the mountains recede far enough from the stream to admit of a few acres of level land being farmed; the rest of the country is too steep for cultivation. Gold is found whereever the river has deposited gravel, whether it be in an old channel 1,000′ above the present river or in the bottom of the stream, deposited yesterday. Water for mining is obtained during the rainy season from the small tributaries, which hold their volume for from six to eight months in the year. In the summer most of the mines shut down for want of water. Supplies are brought into the country by wagon as far as Happy Camp, and from Arcata, in Humboldt County, or Waldo, Oregon, by pack mule. The formation throughout the region is blue-black slate of enormous thickness, lying with a general westerly dip. It is undoubtedly metamorphic Cretaceous shale.

Klein's Mine (Hydraulic and Drift).—See our XIIth Report, p. 286. It lies on North Fork River, below Sawyer's Bar. About ½ acre of bed-rock was cleaned during 1895. W. E. Klein, of Sawyer's Bar, owner.

Klepper Mine (Placer).—This is on Little Humbug Creek, 4¾ miles E. of Walker, at 2,460′ elevation. The claim contains 20 acres, and is worked by ground-sluicing. Wm. Klepper, of Walker, owner.

Knownothing Mine (Quartz).—See our XIIth Report, p. 286. It lies on Knownothing Creek, 8 miles S.E. of Forks of Salmon, at 3,075′ elevation. The developments consist of three tunnels, 400′, 1,300′, and 350′ long. The vein, 18″ thick, was lost several years ago, and the middle long tunnel is being run with a view of finding it again. A 4-stamp mill, driven by a hurdy wheel under 120′ pressure, belongs to the property. W. P. Bennett, of Forks of Salmon, owner.

Lane Mine (Hydraulic).—See our XIIth Report, p. 286. It is on Klamath River, 3 miles below Hamburg Bar, at 1,720′ elevation. Water is taken from O'Neal Creek by a ditch 3′ wide by 2′ deep and 1½ miles long; it is delivered through 800′ of 11″ pipe to a No. 2 giant, under 200′ pressure. There are 800′ of 24″ sluices, with a grade of 8″ per box, and an 80′ bank with 15′ of gravel. D. Lane, of Hamburg, owner.

Lange Mine (Hydraulic).—See our XIIth Report, p. 286. This lies on Barkhouse Creek, 4 miles E. of Walker, at 2,250′ elevation, and embraces 160 acres. The bank is 10′ to 80′ high, and the gravel 6′ to 40′ deep. The equipment consists of 1,000′ of 7″ pipe, a No. 2 giant, working under 250′ pressure, and nearly a mile of 24″ sluices. There are two ditches from Barkhouse Creek; one, furnishing water for the giant, is 3′ wide by 2½′ deep and 5 miles long; the other is 2 miles long and 4′ wide by 3′ deep, and used for the sluices. Large lanterns furnish light at night. Lange Bros., of Oak Bar, owners.

Lango Mine (Quartz).—See David Ledge.

Last Chance Mine (Quartz).—See our XIIth Report, p. 286. It is ¼ mile W. of Oro Fino, and is developed by three tunnels, 300′, 200′, and 100′ long, all on the vein. The ledge averages 2′ in width, and dips 35° S.E. Richard Lindsey, of Oro Fino, owner.

Last Chance Mine (Drift).—See our XIIth Report, p. 286. It lies ¼ mile N. of Callahan, at 3,320′ elevation, and has been idle several years. H. A. Denny et al., of Callahan, owners.

Last Chance (*Grattan*) *Mine* (Quartz).—See our XIIth Report, p. 283. It lies on South Fork River, 6 miles above Forks of Salmon. There is a tunnel 40′ long and some open cuts. The ore is treated in an arrastra. Wagner & Campbell, of Sawyer's Bar, owners.

Last Chance (*Stewart*) *Mine* (Quartz).—This is on Indian Creek, 7½ miles N. of Fort Jones, at 3,225′ elevation. The development consists of a 300′ tunnel. Idle since 1892. George Tonkin, of Fort Jones, owner.

Last Venture Mine (Hydraulic).—It is on Klamath River, 9 miles below Happy Camp, and contains 70 acres, at 1,520′ elevation. Water is obtained from Wingate Creek, through a ditch 2½′ wide by 1½′ deep and ¾ mile long, on a grade of 12.8′ per mile; and delivered through

400′ of 11″ pipe to a No. 2 giant, under 70′ pressure. The sluices are 20″ wide and have an 8″ grade; the bank is 80′ high, with 60′ of gravel. M. Doolittle, of Happy Camp, owner.

Lee Mine (Placer).—It lies on the second bench on Klamath River, 7 miles above Happy Camp, at 1,520′ elevation. Water for ground-sluicing is taken from Joe Miles Creek. Lee & Co., of Happy Camp, owners.

Lee Han (*Bear Bar*) *Mine* (Drift and River).—It is on the Klamath River at Gottville, at 1,975′ elevation, and contains 16.7 acres. It is worked by the help of wing-dams, and requires the use of six river wheels for pumping, dipping, and hoisting. The two pits are 90′ long, and the gravel, of a loose character, is 30′ deep, and carries both fine and coarse gold. The two derricks used have 70′ sweep. The 16″x 15″ flume consists of 200 boxes, set on a grade of 8″ to the box, and paved with blocks. The boxes are cleaned up every week. Fifty Chinese are employed. Lee Han & Co., of Gottville, owners.

Lee Yet Bar Mine (Hydraulic).—This is on the Klamath River, 8 miles below Hamburg Bar, at 1,675′ elevation, and contains 380 acres. The bank is 30′ high, and the gravel 12′. Water is derived from Seiad Creek, through 4 miles of ditch, 4′ wide and 2½′ deep, and delivered through 2,000′ of 24″ and 11″ pipe to three No. 2 giants, under 90′ pressure. Lee Yet Co. (Chinese coöperative), of Seiad, owner.

Leonard Mine (Placer).—See our XIIth Report, p. 286. Abandoned.

Lewis Mine (Quartz).—It lies on Dead Bull Gulch, ¾ mile N. of Oro Fino. The vein shows about 5′ of quartz; but little work has been done on it. Grant Lewis et al., of Oro Fino, owners.

Liberty Mine (Quartz).—See our XIIth Report, p. 286. It is at the head of Eddy Gulch, 4 miles S. of Sawyer's Bar, and adjoins the Golden Ball, at 3,400′ elevation. There are three tunnels on the claim, 25′, 50′, and 80′ long. The ledge is from 3′ to 8′ wide, and dips 20° E. Stevens, Grant & Hughes, of Sawyer's Bar, owners.

Lima Mine (Quartz).—This prospect is on the South Fork of Humbug Creek, about 4 miles W. from Yreka, at 2,400′ elevation. The E. and W. vein is 16″ to 3′ wide, and dips 60° S., between slate and porphyry walls. The quartz is of a gray, ribbon structure, and carries ½% sulphurets. The developments consist of a 45′ cross-cut tunnel to the vein and 50′ of drift thereon. H. Lawson, of Yreka, owner.

Lime Gulch Mine (River).—It is on the Klamath River, just below the mouth of Lime Gulch, at 2,100′ elevation, and contains 20 acres. The river has been wing-dammed, and one dip-wheel and one pump-wheel are used; also a water-power derrick. The gravel is washed through 150′ of sluices. Twelve Chinese are employed. A Chinese company, owner.

Lime Point Mine (Drift).—It is 14 miles N.W. from Yreka, and contains 20 acres. Idle. H. Bucher, of Yreka, owner.

Littlefield Mine (Hydraulic).—This is on Scott River, 1½ miles below Callahan, at 3,210′ elevation, and contains 160 acres; it derives it water from Sugar Creek. A No. 1 giant, under 125′ pressure, is supplied by 1,100′ of 11″ to 15″ pipe. The sluices are 30″ wide, and are set on a grade of 6″ per box. The claim lies on the second bench, and contains no bowlders. W. Littlefield, of Callahan, owner.

Little Humbug Mine (Placer).—It lies on the Klamath River, 2 miles above Walker. B. B. Jackson, of Walker, owner.

Little Queen (*Erno*) *Mine* (Quartz).—See our XIIth Report, p. 281. It is at the mouth of Evans Gulch, in Quartz Valley. There is a shaft 75′ deep, and a tunnel 150′ long on a vein of 6″ to 18″ white quartz, which dips 15° E. The ore is treated in an arrastra, at the rate of 1½ tons per day. A 12′ hurdy wheel, using 25 inches of water, under 80′ pressure, furnishes the power. Elrim Erno, of Fort Jones, owner.

Little Wanderer Mine (Quartz).—It is situated on Cherry Creek, 10 miles S.W. of Yreka, at 4,775′ elevation. The vein is 4″ to 5″ wide, and rich; trends a little E. of N., and dips E.; 100′ of the 200′ tunnel has been stoped and two 45′ winzes sunk. There are about 100′ in backs. One man is at work. J. Ironsides, of Yreka, owner.

Long Gulch Mining Co.'s (*Tim Cardoza*) *Mine* (Placer).—It is in Long Gulch, at 2,500′ elevation, and contains 140 acres. The gravel bank, from 10′ to 12′ deep, is worked by ground-sluicing, taking water from Long Gulch; the season lasts three months; 450′ of flume is used. Five men are employed. Tim Cardoza, of Yreka, owner.

Lowden Mine (Hydraulic).—See our XIIth Report, p. 286. This is on Klamath River, 3 miles below Hamburg Bar, at 1,670′ elevation, and contains 80 acres. Water is taken from Coon Creek by a ditch 3′ wide by 2′ deep and 1½ miles long, and delivered through 1,000′ of 11″ pipe to a No. 2 giant, under 200′ pressure. The sluices are 600′ long, 24″ wide, and paved with block riffles. No derrick is used, the bowlders being blasted. J. S. Lowden, of Hamburg, owner.

Low Hill Mine (Auriferous Trap).—This is 1 mile E. of Summerville, at 3,375′ elevation. There is a tunnel 350′ long on a 4′ vein of trap, containing auriferous pyrite. The walls are eruptive granite. A 4-stamp mill, driven by a hurdy wheel under 100′ pressure, belongs to the property. The stamps weigh 650 lbs.; No. 8 slot screens and 10′ of silvered plates are used. Dr. J. H. Ring et al., of Ferndale, Humboldt County, owners.

Lucky Bar Mine (Hydraulic).—This is 1 mile below Callahan, on Scott River, at 3,240′ elevation. Idle. J. D. Heard, of Callahan, owner.

Lucky Bob Mine (Hydraulic).—See our XIIth Report, p. 287. It is situated at Honolulu (Gottville), at 2,000′ elevation, and consists of 40 acres of bench gravel; the bank is 20′ deep. Water (200 inches) is taken from Lum Gray Creek through ¾ mile of ditch, and passed through a 6″ pipe with a 2″ nozzle, under 65′ pressure. The season lasts four months. The gravel requires some powder to loosen it up. Three quarters of an acre was removed the past season by two men. There are 500′ of sluices, set on a 2″ grade, and paved with blocks. Freshour Bros., of Gottville, owners.

Lucky John Mine (Quartz).—It is on the North Fork of Humbug Creek, at 3,000′ elevation. The vein, of rich rock, is 6″ wide, courses N.E. and S.W., and dips 75° S.E. in granitic rock. An open cut has been started. Two men are working. T. E. Williams and John Martin, of Yreka, owners.

Luke Shaw Mine (Drift).—It is on Indian Creek, 4½ miles N. of Fort Jones, and contains 20 acres. Bedrock lies 45′ below the surface. The claim is worked by drifting, and hoisting the material by a horse-whim through a 4′x 4′ shaft to the surface. Luke Shaw (Chinese), of Fort Jones, owner.

Mabel Mine (Quartz).—See our XIIth Report, p. 287. This lies on the north side of Baldy Ridge, 7 miles N.E. of Scott Bar, at 4,875′ elevation. There are four tunnels on the claim, from 30′ to 180′ long. The vein is from 1′ to 3′ wide, and dips 30° N.W. between porphyry walls. W. A. Chamberlain et al., of Yreka, owners.

Magnitude Mine (Quartz).—It is on the South Fork of Humbug Creek, 5 miles W. from Yreka, at 2,900′ elevation. The 1′ to 4′ wide vein trends N.E. and S.W. and dips vertically between slate and porphyry. The quartz carries 2% of sulphurets and arseniurets. A prospect tunnel has been driven 157′ on the vein. Only assessment work is done. O. H. Lawson, of Yreka, owner.

Maloney Mine (Hydraulic).—See our XIIth Report, p. 287. It is on North Fork River, 2 miles below Sawyer's Bar, at 2,165′ elevation. Water is taken from Jackson Creek by a ditch ½ mile long, and delivered through 200′ of 10″ pipe to a No. 1 giant, under 60′ pressure. Bedrock lies 20′ above the river, and the bank is 30′ high with 3′ of pay-gravel. William Maloney, of Sawyer's Bar, owner.

Maplesden Mine (Hydraulic).—See our XIIth Report, p. 287. This lies on Klamath River, 3 miles below Hamburg Bar, at 1,730′ elevation, and contains 40 acres. The bank is 100′ high, with 30′ of gravel, and the sluices are 24″ wide and 300′ long. There are a No. 1 giant and 700′ of 11″ pipe on the ground; the 2′ ditch is 1½ miles long, and takes water from Nigger Creek. Maplesden Bros., of Hamburg, owners.

Maplesden & Son's Mine (Drift).—See our XIIth Report, p. 287. It is on Klamath River, at Hamburg Bar, at 1,750′ elevation. The main drift runs under the village, is 500′ long, and lies 34′ below water-level. The gravel cars are pulled up a 230′ incline by a water-wheel. The pumping is done by two Chinese pumps, each raising the water 18′. The upper one is driven by the water-wheel direct, and the lower one by wire-rope transmission. The power is furnished by a 14′ hurdy wheel, working under 110′ pressure. Water is obtained from two small creeks through 2 miles of 2′ ditch and 500′ of 9″ pipe. Maplesden & Son, of Hamburg, owners.

McAdams Creek is a small stream, some 15 miles long, the upper end being called Spring Creek. It empties into Scott River, 1 mile W. of Fort Jones. The valley through which it runs consists of gold-bearing gravel, here and there overlaid with sufficient soil to farm. At Fort Jones it is nearly a mile wide, gradually becoming narrower toward its source. From a point 4 miles N. of Fort Jones to its head, the creek-bed was or is still being mined, partly by drift process, where bedrock lies deep below the surface, and partly by ordinary placer operations, where the gravel is shallow.

McCann Mine (Placer).—It is situated at the Forks of Humbug Creek, 7 miles N.W. from Yreka, at 2,700′ altitude, and comprises 600′ along a bar in the channel of Humbug Creek. The gravel bank is 15′ deep, and is worked by ground-sluicing through 10 sluice-boxes, set on an 8″ grade. One hundred inches of water is taken from the North Fork of Humbug Creek through 450′ of ditch, under 20′ pressure. One man is at work. James Man, of Yreka, owner.

McCauley Mine (Drift).—See our XIIth Report, p. 287. It lies on Scott River, 1 mile N. of Scott Bar, at 1,820′ elevation. It is worked by drifting in the bank of the river. James McCauley, of Scott Bar, owner.

McCrey & Maplesden Mine (Hydraulic).—See our XIIth Report, p. 287. It is on the second bench on Klamath River, ½ mile above Hamburg Bar, at 1,860′ elevation. Water is obtained from Tom Martin Creek by a ditch 1 mile in length, and delivered through 300′ of 11″ pipe to a No. 2 giant, under 200′ pressure. The sluices are 30″ wide and 300′ long, with Hungarian and block riffles. B. F. Maplesden et al., of Hamburg Bar, owners.

McGuffy Mine (Hydraulic).—See our XIIth Report, p. 287. It lies at Scott Bar, on the second bench, at 2,120′ elevation. There are 100′ of 30″ sluices and a No. 2 giant, under 100′ pressure. Water is obtained from the Quartz Hill ditch through 300′ of 11″ pipe. The bank is 60′ high, with 10′ of gravel. G. McGuffy et al., of Scott Bar, owners.

McMahon Mine (Drift).—See our XIIth Report, p. 287. It is on the South Fork of Scott River, 3 miles above Callahan. The claim contains 20 acres, and is worked by drifting. J. W. McMahon, of Callahan, owner.

McNeal Mine (Hydraulic).—See our XIIth Report, p. 287. This is on Salmon River, 4½ miles below Forks of Salmon, at 1,020′ elevation, and contains 60 acres. The bank is 18′ high, and all gravel. Water is taken from Nordheimer Creek by a ditch 4 miles long and 5′ wide by 2′ deep, and delivered through 1,000′ of 11″ to 18″ pipe to a No. 3 giant, under 100′ pressure. George McNeal, of Forks of Salmon, owner.

McNeal Bar Mine (Hydraulic).—See Forks.

Metropolitan Mine (Quartz).—See our XIIth Report, p. 287. It lies on White's Gulch, 4½ miles S.E. of Sawyer's Bar. A tunnel 75′ long discloses a 5′ vein, dipping 15° E. Parker & Son, of Etna, owners.

Meyers Mine (River).—It is on a bar in the Klamath River, ½ mile below Hamburg Bar, at 1,745′ elevation. Idle. William F. Meyers, of Hamburg, owner.

Milich Mine (Hydraulic).—See our XIIth Report, p. 288. This lies on Salmon River, 4½ miles below Forks of Salmon, at 1,090′ elevation, and contains 20 acres. Water is obtained from Crapo Creek through a ditch 1½ miles long and delivered through 700′ of 11″ pipe to a No. 1 giant, under 200′ pressure. The bank is 30′ high, and shows 15′ of gravel. P. Milich, of Forks of Salmon, owner.

Miller Mine (Placer).—This lies on the South Fork of Salmon River, 4 miles above Summerville, and contains 40 acres. The bank is 40′ high, with 8′ of gravel; the sluices are 18″ x 18″ and 200′ long, set on a 6″ grade. The ditch takes water from the river and is 1 mile long. J. B. Miller, of Cecilville, owner.

Miller Mine (Drift).—This is on South Fork of Scott River, 5 miles above Callahan, at 4,500′ elevation. The claim is worked by drifting under the river. W. J. Miller, of Callahan, owner.

Miller Mine (Quartz).—This is ⅜ mile N.W. of Oro Fino. The vein is 8″ thick, lies in porphyry, and dips 40° S.E. The developments consist of three tunnels, 100′ to 120′ long. Idle. William Ray et al., of Oro Fino, owners.

Milne Mine (Hydraulic).—It is situated at Scott Bar, at 2,050′ elevation. Water is taken from the Quartz Hill ditch through 800′ of 11″ pipe. The sluices are 24″ wide and 150′ long. The many large bowlders occurring in the mine are removed by a large derrick driven by an overshot water-wheel. A No. 1 giant, under 75′ pressure, is used. The bank is 60′ high, with 20′ of gravel on serpentine bedrock. A. Milne, of Scott Bar, owner.

Mint Mine (Quartz).—It is 1½ miles W. from Yreka, at 3,000′ elevation. The N. and S. vein is 2″ to 8″ wide, and pitches 45° E. in greenstone. A 3′x 6′ shaft has been sunk 40′ deep on the dip of the vein, and a 30′ drift run. Below the shaft a tunnel has been started on the vein. Two men are employed. E. Herr and — Vannader, of Yreka, owners.

Missouri Bar Mine (Placer).—See our XIIth Report, p. 288. This lies on the South Fork of Salmon River, 2 miles above Forks of Salmon, at 1,700′ elevation. Idle. W. P. Bennett, of Forks of Salmon, owner.

Montez Mine (Hydraulic).—See our XIIth Report, p. 288. It is on Salmon River, 5 miles above Somes Bar. Abandoned.

Montezuma Mine (River).—See our XIIth Report, p. 288. This is at Callahan, at 3,500′ elevation, and comprises 60 acres lying along the bed of South Fork River. Bedrock lies from 20′ to 30′ below water-level. All the gravel from the full width of the valley is run through the sluices. The bowlders are removed by a large derrick, using a 2″ manilla rope for hoisting, and driven by a 30″x 14′ overshot water-wheel. The sluices are 4′x 4′ and 3,000′ long. Hop Yick Co. (Chinese coöperative), of Callahan, owner.

Montezuma Hill Mine (Hydraulic).—See Siskiyou Mining Co.

Moore Mine (Placer).—This lies 3½ miles above Sawyer's Bar, on North Fork River, at 2,680′ elevation. A dam in the river, 9′ high, fills a ditch 3′ wide by 2′ deep and 1½ miles long. The sluices are 24″x 12″, and set on a grade of 5″ per box. Worked by ground-sluicing. Thomas Moore, of Sawyer's Bar, owner.

Morgan Point Mine (River).—It lies on Klamath River, 6 miles above Happy Camp, at 1,420′ elevation, and contains 40 acres. Bedrock lies 7′ below water-level. Water is obtained from the river in a ditch 2′ wide by 2′ deep and 1 mile long; three current-wheels furnish the power. Idle. M. Doolittle, of Happy Camp, owner.

Morning Star Mine (Quartz).—This is at the head of Barkhouse Creek, 13 miles S.E. of Scott Bar, at 3,270′ elevation. There is a tunnel 30′ long on a vein of quartz 2½′ thick. The dip is nearly vertical, and the strike N.W. James Wright, of Walker, owner.

Mott Mine (Drift).—It lies on Klamath River, ½ mile above Oak Bar, at 1,920′ elevation, and is worked by drifting in the bank of the river. C. Mott, of Oak Bar, owner.

Mountain Boy Mine (Quartz).—See Schroeder.

Mountain Belle Mine (Quartz).—See Cartwright & Phillips.

Mountain Sprout Mine (Hydraulic).—It is on Klamath River, 10 miles below Happy Camp, at 1,500′ elevation, and contains 140 acres. A ditch 2½ miles long, taking water from Wingate Creek, is under construction. It is to have a grade of 14′ per mile, and to measure 2½′ wide by 1½′ deep. M. Doolittle, of Happy Camp, owner.

Mount Bolivar Mine (Quartz).—This lies on Fox Creek, 5 miles S.W. of Callahan, at 4,620′ elevation. There is a tunnel 40′ long on the claim. George W. Smith, of Callahan, owner.

Muck-a-Muck Mine (Hydraulic).—See our XIIth Report, p. 288. It is on Klamath River, 4½ miles above Happy Camp, and contains 250 acres, lying at 1,430′ elevation. Water is taken from Ambrose Creek through a ditch 2½′ wide by 2′ deep and 4 miles long, and delivered through 2,000′ of 11″ pipe to a No. 2 giant, under 150′ pressure. The bank is 25′ high and about half gravel. The sluices are 20″ wide and have an 8″ grade. Mrs. W. B. Reeve, of Happy Camp, owner.

Musgrave Mine (Placer).—This is on Little Humbug Creek, 5¼ miles E. of Walker, at 2,600′ elevation. The claim contains 20 acres, and is worked by ground-sluicing. Mark Musgrave, of Walker, owner.

Myer & Smith Mine (Drift).—See our XIIth Report, p. 288. It lies on Scott River, just below Sawyer's Bar, at 2,350′ elevation. The claim is worked by drifting in the first bench. Myer & Smith, of Sawyer's Bar, owners.

Nebraska Mine (Quartz).—It is on Cherry Creek, 10 miles S.W. from Yreka, at 4,300′ elevation. The N. and S. vein is about 1′ wide, and dips 55° E. in a hornblendic formation. The quartz is of ribbon structure, with plenty of black oxide of manganese and but few sulphurets. A 3′x 6′ shaft has been sunk 65′ on the vein, and 180′ of tunnel run on the course of the vein. The ore is crushed in a custom arrastra, at a cost of $2 per ton. Two men are employed. H. Mack, of Yreka, owner.

Nelson (Del Monte) Mine (Quartz).—It is on Eliza Gulch, 12 miles N.W. of Yreka, at 4,260′ elevation. The E. and W. vein is 4′ wide, and dips 40° S. in serpentine rock. It has been opened by tunnel and shaft; the former is 350′ long, and the 4′x 7′ shaft is 50′ deep; no timbering required. One man is at work. Haggin & Hearst et al., of San Francisco, owners.

Nesbit & Hunt Mine (Drift).—It is situated at Scott Bar, at 2,050′ elevation. The claim contains 20 acres and is worked by drifting under the bank of the river, water for sluicing being obtained from the Quartz Hill ditch. Nesbit & Hunt, of Scott Bar, owner.

New York Mine (Quartz).—See our XIIth Report, p. 289. This lies on Indian Creek, 9 miles N. of Fort Jones, at 3,300′ elevation. Idle. E. W. Miller, of Fort Jones, owner.

Nicolett Mine (Drift).—It lies at the mouth of White's Gulch, 3½ miles above Sawyer's Bar, at 2,660′ elevation, and is worked by drifting in the first bench. Water for sluicing is obtained, through ½ mile of flume, from White's Gulch. Charles Nicolett, of Sawyer's Bar, owner.

Nicolett Mine (Quartz).—See our XIIth Report, p. 289. It is on Rattlesnake Gulch, near the top of Tanner's Peak, 4 miles S. of Sawyer's Bar. Charles Nicolett, of Sawyer's Bar, owner.

Nigger Hill Mine (Placer).—See our XIIth Report, p. 289. It is situated on the South Fork of Salmon River, 2½ miles above Forks of Salmon, at 1,730′ elevation. Idle. W. P. Bennett, of Forks of Salmon, owner.

Ninety (Hibernia) Mine (Quartz).—See our XIIth Report, p. 284. This is on Eddy Gulch, 3 miles S. of Sawyer's Bar, at 3,350′ elevation. The developments consist of two tunnels, 25′ and 200′ long, respectively. The vein, dipping 40° N., shows 6″ to 36″ of white quartz, with some sulphurets. J. W. Murray, of Sawyer's Bar, owner.

Nolan Mine (Placer).—See our XIIth Report, p. 289. It lies on South Fork River, 8 miles N.W. of Callahan, at 5,900′ elevation. The claim contains 20 acres, and is worked by ground-sluicing. Edward Nolan, of Callahan, owner.

Nolan's Bar Mine (Hydraulic).—See our XIIth Report, p. 289. It is situated on Klamath River, 1 mile below Cottage Grove, at 1,060′ elevation, and contains 80 acres. Water is taken from a small gulch through a ditch 1 mile long and 2′ wide by 1′ deep, and delivered through 150′

of 7″ hose to a 2″ nozzle, under 50′ pressure. The bank is 20′ and the gravel 10′ high. The sluices are 20″ wide, and are set on a grade of 8″ per box. William Thomas, of Cottage Grove, owner.

Nugget Bar Mine (Hydraulic).—See our XIIth Report, p. 289. It lies on the South Fork of Salmon River, 9 miles below Cecilville, at 1,950′ elevation. The bank is 30′ high and all gravel. The equipment consists of a ditch 1 mile long, 500′ of 7″ pipe, a No. 1 giant, a hand derrick, and 300′ of 30″x 20″ sluices, paved with blocks. Parker & Sons, of Etna, owners.

Oak Flat Mine (River).—It is on Klamath River, 8 miles below Happy Camp, at 1,210′ elevation, and contains 20 acres. The claim is on a bar in the river, and the bedrock lies several feet below water-level. The gravel is 8′ deep, and is hoisted by a derrick, driven by an overshot water-wheel, 20′ in diameter and 3′ wide, to the sluices 10′ above the surface of the ground. Water for power and for the sluices is obtained from Oak Flat Creek through a ditch 3′ wide by 2′ deep and 1 mile long. Coon Co. (Chinese coöperative), of Happy Camp, owner.

Oak Grove Mine (Drift).—See our XIIth Report, p. 289. This lies on McAdams Creek, 4½ miles above Fort Jones, and comprises 25 acres of bottom land. Bedrock lies from 60′ to 65′ below the surface. Idle. Theodore Lincoln, of Fort Jones, owner.

Ock Mine (Hydraulic).—See our XIIth Report, p. 289. This is on Klamath River, at 1,360′ elevation, and extends from Happy Camp 3½ miles down the stream. Water is obtained from Indian Creek by two ditches. One is 18 miles long, 5′ wide by 2½′ deep; the other is 3 miles long, 5′ wide by 2′ deep; both have a grade of 6′ per mile. There are one No. 2 and two No. 3 giants, 3,500′ of 20″, 15″, and 11″ pipe, and more than a mile of 24″x 30″ sluices, with block riffles. The bank is 60′ high, with 10′ of gravel, and the pressure is 200′. Siskiyou Mining Co. (Chinese coöperative), owner; Ah Ock, of Happy Camp, superintendent.

O'Donnell Mine (Placer).—It is 1½ miles N. from Hawkinsville, at 1,900′ elevation, and contains 42 acres of land, leased to Chinese. The gravel bank is 20′ high, and is worked by ground-sluicing, with water from Canal Gulch during the wet season, using 300′ of flume. Twelve Chinese are at work. C. O'Donnell, of Hawkinsville, owner.

Offiele Mine (Drift).—It is on Klamath River, opposite Hamburg Bar, at 1,850′ elevation, and contains 20 acres. The claim is worked by drifting a well-defined old channel, 100′ above the water. The gravel is run down a chute to the river, where it is washed. W. P. Offiele, of Hamburg, owner.

Ohio Mine (Quartz).—It is 7 miles W. of Yreka, at 2,900′ elevation. The N.E. and S.W. vein is 8″ wide, and dips 45° E. between granite walls. It is filled largely with ochery matter of high grade. The developments consist of a shaft 80′ deep at the mouth of an 80′ tunnel, both on the vein. The ground is soft and requires heavy timbering. H. Lawsen, of Yreka, owner.

Old Hundred Mine (Placer).—It lies on Indian Creek, 2 miles N. of Hooperville, at 3,420′ elevation. The claim contains 20 acres, and is worked by ground-sluicing. B. M. Hammock, of Fort Jones, owner.

Old Vet and Eclipse (*Hossick & Brown*) *Mine* (Quartz).—It is on the Middle Fork of Humbug Creek, 9 miles N.W. of Yreka, at 3,500′ elevation, and contains two full claims on a vein trending N.W., and dipping E. between porphyry and granite walls. Four tunnels, averaging 35′

in length, have been driven to the ledge along the slope of the hill. No stoping has been done. Two men are employed. G. C. Hossick and — Brown, of Yreka, owners.

Olive Mine (Quartz).—See our XIIth Report, p. 289. It is on Indian Creek, 7 miles N. of Fort Jones. The vein is 14″ thick and dips 40° W. The developments consist of a cross-cut tunnel 200′ long, and 200′ of drifts. Idle. W. C. Doane, of San Francisco, owner.

Olsen Mine (Hydraulic).—See our XIIth Report, p. 289. This lies on North Fork River, 9 miles below Sawyer's Bar, at 2,000′ elevation, and contains 60 acres. Water is conveyed from Cañon Creek through a ditch 3′ wide by 2′ deep and ½ mile long, and delivered through 1,000′ of 14″ to 8″ pipe to a No. 1 giant, under 250′ pressure. The sluices are 18″ wide, have pole riffles, and are set on a 9″ grade. The bank is 150′ high and all gravel, and the bedrock is decomposed granite. Bowlders are removed by a derrick driven by a hurdy wheel. Fred Olsen, of Sawyer's Bar, owner.

Only Hope Mine (Placer).—It is on Eliza Gulch, 14 miles N.W. from Yreka, at 3,650′ elevation. By the aid of small reservoirs the gravel is ground-sluiced during two months of the year; the remainder of the year the bedrock is washed, using 15 boxes furnished with Hungarian riffles. Two men are at work. D. N. Lash, of Yreka, owner.

Oregon Mine (Drift).—See California Bar.

Oregonian Mine (Quartz).—See our XIIth Report, p. 289. It is on Rattlesnake Gulch, near the top of Tanner's Peak, 4 miles N. of Sawyer's Bar. The vein is 6″ thick, and dips from 16° N.W. near the surface to 30° N.W. lower down. Both walls are granite. A 2-stamp mill, 850-lb. stamps, driven by a 5 H.P. engine, belongs to the property. A. R. Campbell et al., of Sawyer's Bar, owners.

Ork Mine (Hydraulic).—This is on North Fork River, 6¼ miles below Sawyer's Bar. The claim contains 20 acres on the second bench. Idle. Frank Hickey, of Sawyer's Bar, owner.

Oro Grande Mine (Quartz).—It is on the divide between Sucker Creek and the Middle Fork of Humbug Creek, 12 miles N.W. from Yreka. The 3″ to 30″ wide vein trends a little E. of N., and dips 35° E. between porphyry and limestone. It has been exploited by two tunnels, 100′ apart; one on the vein for 125′, the other cross-cutting to the vein 60′ and then turned 100′ on the vein. Two men are at work. J. N. Coulson and A. E. Thrash, of Yreka, owners.

Osceola (Franks & Moncton) Mine (Quartz).—See our XIIth Report, p. 289. It lies near the head of White's Gulch, 6 miles S. of Sawyer's Bar, at 3,700′ elevation. The older workings are not extended to the vein. Ore is being quarried from the croppings in open cuts. A 5-stamp water-power mill belonging to the property stands 1,000′ below. The stamps weigh 850 lbs.; No. 9 slot screens and 12′ of silvered plates are used. Osceola Consolidated Gold Mining Co., owner; F. D. Moncton, of San Francisco, secretary.

Pacific River Mine (Placer).—It is near the mouth of Humbug Creek, at 1,900′ elevation, and contains 9½ acres of ground. Idle. Mrs. McConnel and George Simmons, of Yreka, owners.

Paymaster Mine (Quartz).—It is situated on the hill E. of Eddy Gulch, 4 miles S. of Sawyer's Bar, at 4,300′ elevation. There is an incline 50′ deep and a tunnel 60′ long, with a short winze, on the claim. The vein is 3′ thick, and the ore is a reddish quartz, with a large percentage of sulphurets. The dip is nearly perpendicular and the strike is N. 70° W. James Patterson and Edgar Wallace, of Sawyer's Bar, owners.

Pedebedue Mine (River).—This is in the bed of Scott River, ½ mile below Scott Bar, at 1,680′ elevation. A current-wheel is used to run a Chinese pump, and the gravel is taken to the sluices by wheelbarrow. Joe Pedebedue, of Scott Bar, owner.

Peerless Mine (Quartz).—See Schroeder.

Penny Mine (Hydraulic).—It lies 8 miles below Cottage Grove, on the Klamath River, at 1,010′ elevation. The bank is 60′ high, with 15′ of gravel. There are 200′ of 11″ pipe and a No. 2 giant, under 100′ pressure. The sluices are 24″ square and 300′ long, with a grade of 8″ per box. A 2′ ditch, ¾ mile long, brings the water from Dobbin Creek. Henry Penny, of Cottage Grove, owner.

Peters Mine (Quartz).—It is situated at the head of White's Gulch, 6 miles S. of Sawyer's Bar, at 4,725′ elevation. The vein is 8″ thick, lying in slate. There are two tunnels, 60′ and 160′ long, respectively, on the ledge. Peters Bros., of Sawyer's Bar, owners.

Pettit Mine (Hydraulic).—See Scott River Mine.

Phillips Mine (Placer).—See our XIIth Report, p. 290. This lies on Seiad Creek, 5 miles N. of Seiad, at 1,940′ elevation. The ditch is ½ mile long, and takes water from Salt Creek. There is 400′ of 6″ pipe, and a 1½″ nozzle under 80′ pressure, on the claim. The bank is 10′ high and all gravel. Phillips Bros., of Seiad, owners.

Pinkham Mine (Quartz).—It is situated in Evans Gulch, in Quartz Valley. The party holding a bond on the property is driving a 500′ cross-cut tunnel to reach the vein 200′ below the old workings. The tunnel is 400′ long, and the rock in the face is a tough trap. The vein is 18″ to 30″ thick, and is said to be one of the richest in the district. George Buckman, of Oro Fino, owner.

Pitts Mine (Quartz).—See our XIIth Report, p. 290. This lies ½ mile W. of Oro Fino. The vein varies from a mere seam to 12″ in thickness, and is pockety. There is a tunnel 300′ long on the ledge. John Pitts, of Oro Fino, owner.

Pollard Mine (Hydraulic).—See Scott River Mine.

Portuguese Mine (Placer).—This is on North Fork River, 8 miles above Sawyer's Bar, at 2,950′ elevation. A dam in the river, 12′ high, raises the water to a 6′ ditch, ½ mile long. The claim is worked by ground-sluicing. Antone Joseph, of Sawyer's Bar, owner.

Portuguese Bar Mine (Hydraulic).—See our XIIth Report, p. 290. It lies on Klamath River, 2 miles below Seiad, at 1,650′ elevation. The equipment consists of 3,000′ of 20″ to 11″ pipe, one No. 2 giant working under 300′ pressure, and 800′ of 24″ sluices, set on a grade of 8″ per box. The ditch is 3′ wide by 2½′ deep, 1½ miles long, and takes water from Portuguese Creek. James Camp, of Fort Jones, owner.

Poverty Point Mine (Drift).—It is on Klamath River, opposite Oak Bar, at 1,915′ elevation, and contains 40 acres. The claim is worked by drifting the second bench. H. J. Barton, of Oak Bar, owner.

Preckel Mine (Hydraulic).—This is on Mill Creek, near Scott Bar, at 1,920′ elevation. Water is taken from Ferry Creek by a 2′ ditch 1 mile long, and delivered through 600′ of 6″ pipe to a No. 1 giant, under 60′ pressure. The bank is 20′ high, with 7′ of gravel. H. Preckel, of Scott Bar, owner.

Providence Mine (Quartz).—This is ½ mile W. of Oro Fino. The vein averages 12″ in width, dipping 40° S.E. between porphyry walls. The mine is developed by a tunnel 800′ long on the vein. Carson & Cradle, of Oro Fino, owners.

Punch Creek Mine (Quartz).—It is on Punch Creek, 5 miles N.W. from Yreka, at 2,850′ elevation, and comprises two claims, 3,000′ by 600′. The vein is 10″ to 3′ wide, trends N. and S., and dips 65° E. between granitic and porphyry walls. The developments consist of a 5′x 8′ shaft, sunk 40′ on the vein; also two tunnels, 230′ and 170′ long, 90′ apart; 80′ of which is still available for stoping; from the upper tunnel to the surface there are 40′ of backs. The shaft is at the mouth of the lower tunnel. The quartz is of ribbon structure, well mineralized. There is no machinery on the mine. Two men are employed. J. C. Burgess and D. McCook, of Humbug, owners.

Quartz Gulch Mine (Placer).—It lies on Klamath River, 1½ miles above Happy Camp, at 1,380′ elevation. Water for ground-sluicing is obtained from Ambrose Creek by a ditch 2′ wide by 2′ deep and 1½ miles long. David Lane, of Happy Camp, owner.

Quartz Hill Mine (Hydraulic and Quartz).—See our XIIth Report, p. 290. It is situated at Scott River P. O., at 2,000′ elevation, and contains 160 acres. The bedrock consists of alternate ledges of quartz and slate, inclosed by two parallel trap dikes 1,800′ apart. The whole mass of rock is crushed somewhat by the intrusion of the dikes, and on the surface it has disintegrated still more by atmospheric action. The loose material is being piped off, and the hydraulic rig established for that purpose is quite elaborate. There are three ditches from Mill Creek; the first is 3′ wide, 2′ deep, and 7 miles long; the second is 2′ wide, 2′ deep, and 4½ miles long, and the third is 2′ wide, 2′ deep, and 2 miles long. There are 2,200′ of 11″ to 15″ pipe and one No. 3 and two No. 2 giants. The longest ditch furnishes 500′ pressure, to which the crushed bedrock yields readily. Some gold is found throughout the quartz in thin seams, which is saved in the sluices, but the greater part occurs in nests or pockets, combined with pyrite. In piping, close attention is paid to the face, and whenever an iron stain or pyrite is noticed the giant is turned off, and the pocket is quarried out and milled. Upon one of the larger ledges of quartz, called the *Spotted Dog*, a 5′x 12′ double-compartment shaft is sunk 100′, and the quartz was found to pay all the way down. Hoisting is done by a 5′ Pelton wheel. A 10-stamp mill standing on the property is supplied with 750-lb. stamps, No. 7 screens, and 12′ of silvered plates. Water-power for the mill and the hoist is obtained from Scott River by a ditch 3′ wide by 2′ deep and 7 miles long, and through 2,700′ of 15″ and 300′ of 11″ pipe. J. Goldberg, of San Francisco, owner; C. E. Humphrey, of Scott River, superintendent.

Quartz Valley and Oro Fino.—Between Quartz Valley and Oro Fino Creek lies a narrow, low ridge of porphyritic hills, extending about 7 miles N. and S., and containing quite a number of small but generally rich veins of quartz. The valleys on both sides of the ridge are rich in placer gold, and are worked by hydraulicking.

Queen Mine (Quartz).—It is on Cherry Creek, 10 miles S.W. from Yreka, at 4,700′ elevation. The vein is 1′ wide, trends N. 10° E., and dips 55° E. between greenstone and slate walls. There are two tunnels 125′ apart vertically; the upper one cross-cuts 45′ to the ledge, and from it a 75′ winze has been sunk. One mile distant from the mine, on Lime Gulch, is a double arrastra, driven by a 24′ overshot wheel during the five months water-season. Two men are employed. D. Barnes, of Yreka, owner.

Quinn & McConnel (*Campbell & Austin*) *Mine* (River).—It is on a bar in the Klamath River, just below the mouth of Humbug Creek, at 1,900′ elevation, and comprises 44½ acres. The gravel-pit is 40′x 60′ and 32′ deep; three such pits are worked by means of wing-dams in each season of six months. The gravel requires some blasting. A 30 H.P. engine is used for hoisting and pumping, and a 6 H.P. engine drives a dynamo for lighting purposes. Work is continued night and day by 20 Chinese and 4 white men; four tubs of gravel of about 2,000 lbs. each are hoisted per shift. Dr. Songer et al., of Yreka, lessees.

Ramus Mine (Drift).—See our XIIth Report, p. 290. This lies on Scott River, 1½ miles N. of Scott Bar, at 1,890′ elevation, and is worked by drifting in the second bench. Joe Ramus, of Scott River, owner.

Ramus Mine (Drift).—It is on Klamath River, 1¾ miles below Hamburg Bar, at 1,660′ elevation, and is worked by drifting in the second bench. Charles Ramus, of Oak Bar, owner.

Red Hill Mine (Hydraulic).—See our XIIth Report, p. 290. This is at the mouth of Knownothing Creek, 2 miles above Forks of Salmon, at 1,740′ elevation. Parker & Sons, of Etna, owners.

Red Hill Mine (Hydraulic).—It lies on North Fork River, 4¾ miles below Sawyer's Bar, at 2,220′ elevation. The claim is nearly worked out. A. Ahlgren, of Sawyer's Bar, owner.

Red Hill Mine (Hydraulic).—It is situated on Klamath River, 23 miles below Cottage Grove, at 960′ elevation, and contains 60 acres. The bank is 15′ high, with 9′ of gravel. The sluices are 24″ wide, and the No. 2 giant acts under 130′ pressure. Water is obtained from Runnel's Creek through a ditch ¾ mile long. William Lord, of Orleans, Humboldt County, owner.

Reliable and Extension Mine (Quartz).—It is a prospect, on Hungry Creek, 9 miles from Cole's Station, on the C. & O. R. R., and consists of two locations on an E. and W. vein about 2′ wide, dipping N. between granite walls. A 200′ tunnel has been driven on the vein. J. L. Coyle, of Hornbrook, owner.

Rhinehold Mine (Hydraulic).—See our XIIth Report, p. 291. This lies on East Fork of Salmon River, 6 miles E. of Cecilville. The ditch from Taylor Creek is 3½′ wide, 2′ deep, and ¾ mile long. There is 400′ of 10″ pipe and a No. 1 giant, under 150′ pressure. The bank is 30′ high, and all gravel. J. J. Rhinehold, of Cecilville, owner.

Rider Mine (Hydraulic).—It is on Little Humbug Creek, 4½ miles E. of Walker, at 2,325′ elevation. A ditch 1 mile long takes water from Little Humbug Creek, and delivers it through 175′ of 6″ pipe and with a 1½″ flexible nozzle. The bank is 30′ high, and has 7′ of gravel. White & Rider, of Walker, owners.

Roberts Mine (Quartz).—See our XIIth Report, p. 291. It lies at the head of Eddy Gulch, 4 miles S. of Sawyer's Bar, at 3,600′ elevation. The vein is exposed in two tunnels, 90′ and 115′ long, and shows 10″ to 18″ of white quartz. The ore is treated in an arrastra run by an overshot wheel. Eddy Roberts, of Sawyer's Bar, owner.

Robertson Mine (River).—It is situated on Horse Creek, 15½ miles N.W. of Oak Bar, at 2,280′ elevation. The claim contains 40 acres of creek-bed and bottom land, and is mined by hoisting the gravel to the surface. Power for the derrick and a large Chinese pump is obtained by an overshot water-wheel. A Chinese company, owner.

Robinson Mine (Placer).—This lies on Mill Creek, 5½ miles E. of Scott Bar, at 2,560′ elevation. The claim contains 20 acres, and is worked by ground-sluicing. J. Robinson, of Scott Bar, owner.

Roche Mine (Placer).—It is on Scott River, at Callahan, at 3,330′ elevation, and comprises 120 acres. The claim is worked by ground-sluicing, water being taken from the river through a ditch 1½ miles long.

Rock Creek Mine (Hydraulic).—This is on Klamath River, 9 miles below Cottage Grove, at 1,025′ elevation, and embraces 80 acres. The bank is 100′ high, with 10′ of gravel. The sluices are 24″ wide. Water is taken from Rock Creek by a ditch 4′ wide by 2′ deep and 1½ miles long, and delivered through 1,000′ of 11″ and 15″ pipe to a No. 2 and a No. 3 giant, under 150′ pressure. Frank Hostetter, of Cottage Grove, owner.

Roff Mine (Quartz).—It lies on Indian Creek, 2 miles N.W. of Cecilville, at 2,680′ elevation. The vein is from 8″ to 12″ thick, and the development consists of three tunnels from 40′ to 80′ long. Charles Roff, of Cecilville, owner.

Rosalie Mine (Quartz).—See Schroeder.

Rout Mine (Quartz).—It is on French Creek, 7 miles S. of Etna. The 2′ vein is worked through a tunnel 300′ long. Idle. Charles Rout, of Etna, owner.

Runnel's Creek Mine (Hydraulic).—This is on Klamath River, 23 miles below Cottage Grove, and contains 80 acres, lying at 810′ elevation. The bank is 80′ high, with 15′ of gravel on bedrock, mixed with many large bowlders. A ditch ½ mile long and 3′ wide by 2′ deep takes water from Runnel's Creek and passes it through 700′ of 11″ to 15″ pipe to a No. 3 giant, under 230′ pressure. The sluices are 24″ wide, and paved with block riffles. A large derrick is driven by a hurdy wheel. William Lord, of Orleans, Humboldt County, owner.

Rycroft Mine (Drift).—It lies on Slide Creek, 6¼ miles S.W. of Callahan, at 5,570′ elevation, and contains 20 acres. The claim is worked by drifting in the creek bank. S. Rycroft, of Callahan, owner.

Saint Lawrence Mine (Quartz).—It is situated at the head of Pioneer Gulch, in Quartz Valley. The vein is 4″ to 24″ wide, lies in porphyry, and dips 40° E. There are two cross-cut tunnels, 130′ and 400′ long, respectively, and a 130′ drift on the vein in the shorter one. A. G. Myers, of Fort Jones, owner.

Salmon Mine (Placer).—This lies at the mouth of Wildcat Creek, 1 mile W. of Callahan, at 3,270′ elevation, and is worked by ground-sluicing. M. J. Salmon, of Callahan, owner.

Salmon River Mine (Hydraulic).—It is on the North Fork of Salmon River, 5 miles N.E. of Sawyer's Bar, at 2,800′ elevation, and contains 340 acres, extending about a mile along the river. There are two benches which it is intended to mine. The lower one contains 15′ to 20′ of gravel, with the bedrock only a few feet above the river, while the upper one lies 80′ higher and has 120′ of gravel. Preparations are made to attack the upper bench first. There are 1,600′ of 15″, 20″, and 22″ pipe on the ground, and two No. 6 giants with 6″ and 7″ nozzles. The sluices are 5′ wide, 32″ high, paved with blocks, and are set on a grade of 6″ per box. A ditch 4 miles long is under construction, and will consist mostly of 5′x 4′ flume, with a grade of 12.8′ per mile. About 1½ miles from the dam a sawmill has been built to furnish the necessary lumber. It has a 25 H.P. engine, a 60″ circular saw, and turns out about 8,000 feet of lumber per day. Salmon River Hydraulic Gold Mining and Ditch Co., owner; William Harrington, of Sawyer's Bar, superintendent.

San José Mine (Hydraulic).—This is 1 mile N. of Scott Bar, on the second bench, at 2,350′ elevation. Water is taken from Tompkin's Creek by a ditch 4′ wide, 2′ deep, and 10 miles long. Fifteen hundred feet of 18″ to 24″ pipe and a No. 6 giant, under 200′ pressure, are used. Idle. San José Milling, Mining, and Ditch Co., owner.

Santana Bros. and J. Noe Mine (Placer).—It is ¾ mile N. from Hawkinsville, at 2,500′ elevation, and contains 50 acres. The gravel bank, from 10′ to 12′ high, is worked by ground-sluicing, obtaining the required water from springs and gulches on and in the vicinity of Rocky Gulch. The flume is 1,200′ long, set on a 4″ grade, and furnished with slat riffles. The dump is into Yreka Creek. Five men are employed. Santana Bros. and Joe Noe, of Hawkinsville, owners.

Sargent Mine (Placer).—It lies on Grouse Creek, 4½ miles E. of Callahan, at 3,820′ elevation. The claim contains 20 acres, and is worked by ground-sluicing. George Sargent, of Callahan, owner.

Sauerkraut Mine (Hydraulic).—See our XIIth Report, p. 291. It is situated on Salmon River, 5 miles below Forks of Salmon. The bank is 40′ high and the gravel 20′. Two No. 1 giants, under 220′ pressure, and 1,500′ of 11″ pipe are used. The ditch, taking water from Morehouse Creek, is 3′ wide, 2′ deep, and 2 miles long. George McNeal, of Forks of Salmon, owner.

Schroeder Mine (Quartz).—See our XIIth Report, p. 291. It is near Deadwood Gulch, 7 miles W. of Yreka, at 5,750′ elevation, and comprises five patented claims, including six blind veins of quartz, known as the *Blue*, *Coon*, *Mountain Boy*, *Rosalie*, *Vivian*, and *Way Up*, all of which have a general N. and S. course with a slight easterly variation, and dipping E. at angles varying from 38° to nearly vertical. The formation is slate and diabase. The location of the veins is such that they can be developed by tunnels driven directly on their strike. The Mountain Boy vein carries a heavy percentage of mispickel, and has furnished considerable nugget gold. Up to date the chief development has been on the Rosalie vein, which carries free-milling quartz. Tunnel No. 1, 500′ above the mill, is on the Mountain Boy; the vein carries mispickel, has been drifted 130′, and shows a good grade of ore at the breast. Tunnel No. 2 is on the Blue ledge, 350′ from No. 1, and has a cross-cut over to the Rosalie 300′ long, and a 160′ drift along the latter. A 40′ winze sunk on the Rosalie below the drift shows a vein, averaging 5′ in thickness, of a good grade of ore; an intermediate drift going N. on the vein proves the continuance of a good vein. Water was encountered at the bottom of the winze. Tunnel No. 3 is 135′ above, and is also on the Rosalie, and has been driven 1,000′ on the vein, disclosing a faulting of the vein. About 150′ above, also on the Rosalie, No. 4 tunnel has been driven over 1,200′ on the vein; and 140′ still higher, tunnel No. 5 is 1,400′ in on the same vein. The uppermost tunnel, 130′ higher, on the Rosalie, is 400′ long; the vein from here to the surface has been mostly stoped out. The vein swells and contracts, but averages 5′ in width; the yield along the vein is likewise variable.

The ore from the different localities is dumped to the level of tunnel No. 2 and conveyed thence by a three-rail tramway, with turn-out in middle, on a 27° angle, to the ore-bins in the mill, which hold 130 tons. On account of the shelly nature of the wall rock, heavy, close timbering is required in the mine. These timbers are procured abundantly on the property, at an expense of 1 cent per running foot. The 10-stamp steam-mill is run only during the day. It is furnished with Challenge ore-feeders; 800-lb. stamps, dropping 90 times per minute; No. 11 slot screens; aprons set on a ½″ grade to the foot; followed by 4′x 6′ shaking-tables, set level, with 3″ throw; and two Frue concentrators. The machinery is all operated by a 36 H.P. engine. The capacity of the mill is 12 to 13 tons in twelve hours. Nine tenths of the amalgam is retained in the battery. Seven men are employed in the mine and one in the mill. J. H. C. Schroeder, of Yreka, owner.

Schuler Mine (Drift).—This is on Scott River, at Scott Bar, at 2,050′ elevation, and is worked by drifting in the west bank of the river. Martin Schuler, of Scott Bar, owner.

Schuler Mine (Placer).—It is on Slide Creek, 5¼ miles S.W. of Callahan, at 4,730′ elevation. The claim contains 20 acres, and is worked by ground-sluicing. The bank is 30′ high, and contains many large bowlders, which are removed by a hand-power derrick. J. M. Schuler, of Callahan, owner.

Scott River.—On the headwaters of this stream, in the vicinity of Callahan, and especially on the South Fork, rich deposits of gravel are found. They have been mined for many years, and operations on a large scale are still being prosecuted. Below Callahan the river runs through a wide and fertile valley, which is successfully cultivated. Gold, no doubt, exists here near the bedrock, but the soil is too deep to allow of its being mined profitably. The flourishing towns of Etna and Fort Jones lie in this section. The lower part of the river, for about 3 miles above its mouth, runs through a cañon, and here gold is found in the benches on the hillsides and in bars in the river. The village of Scott Bar lies in the center of this district, and is a center from which supplies are furnished. Several rich quartz veins have been found lately, and no doubt many more exist in the neighborhood, awaiting the pick of the persevering prospector.

Scott River Mine (Hydraulic).—It is situated on the South Fork of Scott River, 2½ miles S.W. of Callahan, at 3,740′ elevation. It embraces the claims formerly known as the *Boye*, *Chapman*, *Pettit*, and *Smiley*, consisting of about 1,000 acres of partly bench and partly creek-bottom land. It is being piped in two places; at the lower one, water is taken from Boulder Creek by a ditch 2¾ miles long, 3′ wide by 2½′ deep, and with a grade of 25′ per mile, and passed through 1,000′ of 15″ pipe to a No. 6 giant, under 300′ pressure. The bank is 50′ high, and the gravel, which contains many small bowlders, is 20′ deep. The 4′x 3′ sluice is reinforced by a 6′x 4′ flume from the river, 300′ long, with a grade of 26′ per mile, to keep the lower end of the sluice clear from debris. A small derrick is run by an overshot wheel. At the upper place, water is taken from Fox Creek by a ditch ½ mile long and 5′ wide, 3½′ deep, with a grade of 90′ per mile, and delivered through 800′ of 11″ and 500′ of 10″ and 8″ pipe to two giants, Nos. 1 and 2, under 180′ to 275′ pressure. The sluices are 4′x 4′ and 300′ long, set on a grade of 6″ per box. On the second bench, 100′ above these diggings, the gravel lies 20′ deep, in a bank of 30′ to 50′ high. It is known to be rich, but is not worked at present. Scott River Mining Co., owner; F. P. King, of Callahan, manager.

Sheffield Mine (Hydraulic).—See our XIIth Report, p. 291. Worked out and abandoned.

Sheffield Mine (Quartz).—See Uncle Sam.

Shell's Mine (Drift and Placer).—This lies in Pinery Gulch, in Quartz Valley, and is worked both by drifting and ground-sluicing, about 200 inches of water for that purpose being obtained from Emigrant Creek through a 6″ pipe. The bank is 40′ high, and all gravel. William Shell, of Fort Jones, owner.

Sherman Mine (Hydraulic).—It is on Horse Creek, 10 miles N.W. of Oak Bar, at 2,060′ elevation, and contains 160 acres. A mile of ditch and 300′ of 7″ pipe give a pressure of 60′ to the No. 1 giant; 200′ of 18″ sluices are used. W. B. Morgan, of Oak Bar, owner.

Shiner Mine (Hydraulic).—See our XIIth Report, p. 291. This is on Klamath River, 9 miles above Happy Camp, at 1,510′ elevation. A No. 2 giant, under 150′ pressure, 800′ of 11″ pipe, and 300′ of 18″ sluices set on a grade of 8″ per box, are used. The 1-mile ditch collects water from small gulches. John Shiner, of Happy Camp, owner.

Shore Mine (Placer).—It lies on Indian Creek, 3½ miles N. of Happy Camp, at 1,500′ elevation, and contains 10 acres. The claim is worked by ground-sluicing, water being obtained from Indian Creek by a ditch 1 mile long. G. Shore, of Happy Camp, owner.

Short Mine (Placer).—See our XIIth Report, p. 292. It is situated on Trail Creek, 14 miles W. of Callahan, and is worked by ground-sluicing. W. F. Short, of Callahan, owner.

Short Mine (Quartz).—See our XIIth Report, p. 292. It is on Trail Creek, 10 miles E. of Cecilville: The vein is 4′ thick, and the development consists of 800′ of tunneling. A 2-stamp water-power mill belongs to the property. W. Walters et al., of Callahan, owners.

Shumway Mine (Hydraulic).—See our XIIth Report, p. 292. This is on North Fork River, 1 mile above Forks of Salmon, at 1,410′ elevation, and contains 40 acres. Water is taken from the river, the ditch being 3′ wide, 2′ deep, and 1 mile long, with a 14′ grade; 500′ of 11″ pipe creates a pressure of 80′ on the No. 1 giant, and the sluices are 24″ wide with a 6″ grade. The bank is 40′ high. Shumway Bros., of Forks of Salmon, owners.

Sightman Mine (Hydraulic).—See our XIIth Report, p. 292. It lies on South Fork of Salmon River, ½ mile below Cecilville, at 2,360′ elevation, and contains 20 acres. The sluices are 24″x 18″ and have a grade of 6″ per box. The No. 1 giant is supplied with water under 150′ pressure by 300′ of 18″ pipe and a ditch 2 miles long, taking water from Crawford Creek. George H. Sightman, of Cecilville, owner.

Silveira Mine (Placer).—It is situated on the Main Fork of Eddy Gulch, 3½ miles S. of Sawyer's Bar, at 3,150′ elevation, and is worked by ground-sluicing. P. L. C. Silveira et al., of Sawyer's Bar, owners.

Sirly Mine (Placer).—This lies on Little Humbug Creek, 3 miles E. of Walker, at 2,140′ elevation. The claim contains 20 acres, and is worked by ground-sluicing in the creek-bed. S. H. Sirly, of Walker, owner.

Siskiyou Mine (Quartz).—It lies 7 miles N.W. from Yreka, on the Middle Fork of Humbug Creek, at 2,950′ elevation. The vein, 2′ wide, trends N. and S., and dips 50° E. between porphyry walls. A 160′ shaft with 50′ and 100′ drifts has been sunk on the vein, and all show good ore. There is a 4-stamp mill with 600-lb. stamps, driven by an 8 H.P. engine.

Siskiyou Mining Co.'s Mine (Hydraulic).—It is on Klamath River, 14 miles below Happy Camp, at 1,370′ elevation. It contains about 2,000 acres, and includes the old *Montezuma Hill* property. The company has acquired most of its land only lately, and has just completed a ditch 4′ wide, 3′ deep, and 11 miles long, to convey water from the South Fork of Clear Creek. A complete equipment to work the mine on a large scale is being "packed" in. The old plant now in use consists of 2,000′ of 11″ pipe, a No. 4 giant under 150′ pressure, and a ditch 2′ wide, 2′ deep, and 2 miles long, taking water from Crawford Creek. The sluices are 4′ wide, and the bank 50′ to 150′ high. Siskiyou Mining Co., owner; J. D. Fraser, of Fort Jones, superintendent.

Skunk Hill Mine (Hydraulic).—See our XIIth Report, p. 292. This is on Scott River, 2 miles below Scott Bar. Worked out and abandoned.

Slap-jack Mine (Hydraulic).—See Finley.

Smiley Mine (Hydraulic).—See Scott River Mine.

Smith Mine (Drift).—It lies on Klamath River, 5 miles above Happy Camp, at 1,460′ elevation, and is worked by drifting in the second bench. L. P. Smith, of Happy Camp, owner.

Smith Mine (Hydraulic).—See Scott River Mine.

Smith & Merriam Mine (Quartz).—See our XIIth Report, p. 292. It is situated in White's Gulch, 4½ miles S.E. of Sawyer's Bar, at 3,360′ elevation. The vein is 4′ wide, and dips 40° S. There is a 250′ tunnel on the vein, from which about 100 tons of ore have been mined. John J. Smith and Henry M. Merriam, of Sawyer's Bar, owners.

South Fork of North Fork of Humbug Creek Mine (Placer).—It is near the headwaters of Humbug Creek, and is worked by 4 Chinese. A Chinese company, owner.

Specimen Mine (Quartz).—It lies at the head of Craig's Gulch, 5 miles W. of Callahan, at 4,120′ elevation. A shaft, 20′ deep, exposes a vein of quartz 2½′ thick, dipping 40° E. L. S. Barr et al., of Callahan, owners.

Spencer (*Goodenough*) *Mine* (Quartz).—See our XIth Report, p. 445. It is 12 miles N.W. from Yreka, at 4,500′ elevation. The property embraces eight claims. The vein varies from a few inches to several feet, courses E. and W., and dips about 35° to 40° S.E. The pay-ore is found in lenticular masses. It was opened by a 5′x 12′ incline shaft, said to be 240′ deep, which is at present partly filled. A drift from the bottom extended 180′ W., and this block was stoped out to the surface. A tunnel with 30′ of backs has been driven on the vein. The property has been dismantled, and is going to decay under the presumption that it is worked out, which means, in this case, all the visible ore-supply extracted. Bank of Yreka, owner.

Spengler Mine (Placer and Hydraulic).—See Humbug Flume and Mining Co.

Squaw Gulch Mine (Hydraulic).—It is on Sugar Creek, 4 miles N.W. of Callahan, at 3,420′ elevation, and contains 60 acres. Water is taken from Sugar Creek, through 8 miles of ditch 2½′ wide, 2′ deep, and delivered through 1,000′ of 6″ pipe to a No. 2 giant, under 100′ to 250′ pressure. The sluices are 600′ long, 20″ wide, and have a fall of 6″ per box.

The bank is 12′ high, and all gravel. Jean Boulangeot, of Callahan, owner.

Standard Mine (Quartz).—See Claughry.

Star Mine (Quartz).—This is in Hull Gulch, Quartz Valley, at 3,300′ elevation. The vein is 4″ thick, and is developed by three tunnels, 70′, 160′, and 250′ long, respectively. David Star, of Oro Fino, owner.

Steamboat Mine (Drift).—It is situated on McAdams Creek, 4 miles N.E. from Fort Jones, at 3,625′ elevation, and embraces several old claims, in all about 2½ miles along the course of the creek. The top ground was worked in earlier days, but bedrock has never been reached, on account of the difficulty experienced in handling such a large amount of water as was encountered. The present owners are sinking a 6′x 14′ three-compartment shaft, which will be 100′ deep on reaching bedrock, and are equipping it with a double-drum hoist and three Dow pumps with 16″ steam cylinders, 14″ pump cylinder, 18″ stroke, and 8″ discharge pipes, to be driven by a 75 H.P. engine under 60 lbs. pressure. A drain tunnel is planned and started to come up the course of the creek for 1½ miles, where it will reach bedrock; it will be driven from three shafts, equipped with donkey engines. Ten men will be employed, the crew to be increased as required. N. Bennett and A. C. Brokaw, owners; A. C. Brokaw, of Fort Jones, superintendent.

Steel Mine (Quartz).—It is situated in Evans Gulch, Quartz Valley, at 3,550′ elevation. The developments consist of a tunnel 160′ long on the vein, a shaft 160′ deep, and a cross-cut 60′ long to meet it at the bottom. The vein contains 8″ to 18″ of quartz. Charles Sargent, of Fort Jones, owner.

Stenshaw Mine (Hydraulic).—This lies on Klamath River, 15 miles below Cottage Grove, at 860′ elevation, and contains 160 acres. The bank is 50′ high, and has 10′ of gravel; a No. 3 giant, under 150′ pressure, and 800′ of 11″ pipe are used. Water is obtained from several small creeks through a ditch 2 miles long. Sam Stenshaw, of Cottage Grove, owner.

Sterling Mine (Quartz).—It lies on Hungry Creek, 9 miles W. of Cole's Station, on the O. & C. R. R. The 5′ vein courses E. and W., and dips N. between syenite walls, the quartz carrying about 1% sulphurets. The developments include a 90′ shaft, and at a point 400′ distant a 125′ cross-cut tunnel to the vein. There is a 30 H.P. steam-engine for motive power for the hoist and 10-stamp mill. Idle. J. Sterling, of Coles, owner.

Sterling Mine (Quartz).—This is on the East Fork of Deadwood Creek, 13 miles N.W. of Fort Jones. The vein is about 16″ thick, and consists of white quartz, with specks of zinc-blende and copper and iron pyrites. Two tunnels, 100′ to 175′ long, connected by a winze, are driven on the vein. Will Crocker, of Fort Jones, owner.

Stewart Mine (Hydraulic).—See our XIIth Report, p. 293. It is in White's Gulch, a tributary of Indian Creek, 7 miles N. of Fort Jones, at 3,230′ elevation. About 300 inches of water are obtained from White's Gulch through 1,000′ of 6″ and 8″ pipe, and used through a No. 1 giant with 2″ nozzle. The sluices are 24″x 14″, and paved with block riffles. The bank is 10′ high, with 2′ of gravel. J. Moore and Luke Shaw, of Fort Jones, owners.

Stewart Mine (Quartz).—See Last Chance.

Stillwell Mine (Placer).—See our XIIth Report, p. 293. Worked out and abandoned.

Stockton Mine (Drift).—See our XIIth Report, p. 293. It lies in the Pinery, in Quartz Valley. Idle. Stockton Gravel Mining Co., owner; H. Rodbruch, of Fort Jones, agent.

Stowell Mine (Hydraulic).—See Scott River Mine.

Sugar Hill Mine (Drift).—See our XIIth Report, p. 293. It is situated on Fox Creek, 5 miles S.W. of Callahan, at 4,560′ elevation, and contains 20 acres. It is worked by drifting in the creek-bed. Bedrock is serpentine. George W. Smith, of Callahan, owner.

Sulphur Spring Mine (Placer).—It is on the Left Fork of Empire Creek, ½ mile above the forks and 2 miles above the Empire Mine, at 2,650′ elevation. There are two claims, containing 16′ in depth of free gravel, on a slate bedrock; 12′ of this is ground-sluiced; the remaining 4′, next the bedrock, has to be picked and shoveled into the sluices. Six boxes, set on a 6″ grade, are supplied with Hungarian and pole riffles. One man is at work. T. B. Southwark, of Gottville, owner.

Summerville Mine (Hydraulic).—See our XIIth Report, p. 293. This lies at Summerville, and extends 5 miles along the South Fork of Salmon River. The ditch taking water from the river is 6′ wide, 4′ deep, and 15 miles long. The bank varies from 10′ to 30′, and the gravel averages 8′ deep. The sluices are 4′x 3′, with block riffles. There are more than 2 miles of 11″ to 24″ pipe, and three No. 2 giants, working under 350′ pressure, on the claim. Spooner, Smith & Campbell, of Etna, owners.

Sunshine Mine (Quartz).—It is on Sucker Gulch, in Quartz Valley, at 3,110′ elevation. There are two veins, 8″ and 10″ thick, respectively, about 3′ apart, and the developments consist of a shaft 30′ deep and a tunnel 120′ long, both on the vein. The dip is 20° E., and the walls porphyry. E. Erno, of Fort Jones, owner.

Sweringen Mine (Placer).—This is on Indian Creek, 10 miles N. of Happy Camp, at 1,960′ elevation, and contains 20 acres. Worked by ground-sluicing. B. Sweringen, of Happy Camp, owner.

Swiss Bar Mine (Placer).—It is in the vicinity of Gottville. Idle.

Taylor Mine (Placer).—It is situated on North Fork River, 4½ miles above Sawyer's Bar, at 2,750′ elevation, and contains 80 acres. The water-supply obtained from small tributaries is not sufficient, and it is intended to build a flume 2 miles long to Russian Creek. There are 200′ of 10″ pipe and two No. 2 giants on the claim. H. P. Taylor Mining Co., owner; J. Henry Smith, of No. 431 California Street, San Francisco, secretary.

Taylor & Co. (*Taylor & Maplesden*) *Mine* (Drift).—See our XIIth Report, p. 293. It lies at Hamburg Bar, on Klamath River, at 1,760′ elevation. The bedrock lies 30′ below water-level, and the drifts are under the village. Access is gained through an incline 80′ long. About 20 cars of gravel are hoisted per day. Power is obtained from an undershot wheel 16′ in diameter and 8′ wide, the water being taken from the river through a short ditch, 6′ wide. E. R. Taylor et al., of Hamburg, owners.

Tea Bar Mine (Hydraulic).—See our XIIth Report, p. 293. This lies on Klamath River, 9 miles below Cottage Grove, at 970′ elevation, and contains 100 acres. The bank is 12′ high, with 7′ of gravel; two giants, Nos. 2 and 4, under 100′ pressure, and 700′ of 11″ pipe are used. Water is taken from Tea Creek by a ditch 3′ wide, 2′ deep, and 1 mile long. Hay Mining Co. (Chinese coöperative), of Cottage Grove, owner.

Ten Eyk Mine (Hydraulic).—It is on Klamath River, 25 miles below Cottage Grove, at 1,020′ elevation, and contains 80 acres. Water is taken from Ten Eyk Creek through a ditch ½ mile long, and delivered through 1,000′ of 10″ pipe to a No. 2 giant, under 200′ pressure. The sluices are 22″ wide. The bank is 20′ high, and consists almost entirely of large bowlders, which are disposed of by a large derrick, with iron double-gear hoist, driven by a 6′ hurdy wheel. A mill with a gang-saw furnishes lumber for the claim. William Lord, of Orleans, Humboldt County, owner.

Texas Mine (Hydraulic).—This is on Klamath River, 2½ miles below Happy Camp, at 1,300′ elevation, and contains 160 acres. The claim is worked by the plant of the Grider Mine, which it adjoins. Ah Ock, of Happy Camp, owner.

Thompson Mine (Drift).—It is situated on South Fork of Salmon River, 25 miles N.W. from Trinity Center, Trinity County, at 4,800′ elevation, and adjoins the Deep Bank claim. It includes 30 acres. There are two tunnels driven into a 200′ bank of gravel; the upper one is 80′ above bedrock and 120′ long, with an E. and W. branch tunnel 100′ long, with breasts 6′ high and 15′ wide. The other tunnel is on bedrock, 300′ long, also breasted 6′ high and 15′ wide; here the gravel pays 50 cents per foot. Three men are at work. W. Thompson, of Abrams, Trinity County, owner.

Tiger Mine (Quartz).—See our XIth Report, p. 437. It is situated in Hull Gulch, in Quartz Valley, at 3,250′ elevation. The 8″ vein is developed by a 300′ tunnel. C. A. Sargent, of Fort Jones, owner.

Tiger Fork Mine (Placer).—This lies on Sugar Creek, 5 miles N.W. of Callahan. A ditch, 3 miles long, from Sugar Creek, is being dug to supply the necessary water. George Fader, of Callahan, owner.

Tillman Mine (Drift).—It is on White's Gulch, 3½ miles E. of Sawyer's Bar, at 2,660′ elevation. The claim is worked by drifting in the bank of White's Creek. Frank Tillman, of Sawyer's Bar, owner.

Tim Cardoza Mine (Placer).—See Long Gulch Mining Co.

Tompson Creek Bar Mine (Hydraulic).—It lies at mouth of Tompson Creek, 10 miles above Happy Camp, at 1,500′ elevation. Idle. John C. Wood, of Seiad, owner.

Tom Rogers' Mine (Placer).—It is ¼ mile S. from Hawkinsville, at 2,500′ elevation. The gravel bank, from 15′ to 18′ high, is worked by ground-sluicing, with the occasional use of a pipe with 2″ nozzle. Two cuts are being brought up on opposite sides of Canal Gulch by the use of 300 miner's inches of water from the old Sproul or lower Greenhorn ditch; the water season lasts four months; 1,600′ of sluices are used for washing the gravel. Eight men are employed. Phillippe Bros. et al., of Hawkinsville, owners.

Uncle Sam Mine (Quartz).—It is on the divide between Sucker Creek and the Middle Fork of Humbug Creek, 12 miles N.W. from Yreka, at 3,600′ elevation. The vein trends N.E. and S.W., and dips about 40° E. in porphyritic rock. The developments consist of a 140′ shaft, with drifts at 60′ and bottom, extending 155′ S. and 150′ N., respectively. There is an 8 H.P. steam hoist. Two men are employed. J. N. Conson and A. E. Thrash, of Yreka, owners.

Uncle Sam (*Sheffield*) *Mine* (Quartz).—See our XIth and XIIth Reports, pp. 433 and 293. This is at the head of White's Gulch, 7 miles S. of Sawyer's Bar, at 5,140′ elevation. The vein averages 3½′ of quartz, dipping 45° S.E., between porphyry hanging-wall and slate foot-wall. The mine is worked by four cross-cut tunnels, from 100′ to 150′ apart. They are respectively 120′, 250′, 370′, and 550′ long, and the drifts at their faces are 400′, 250′, 100′, and 300′ long. A 3½′x 4′ air-shaft 364′ deep connects with the lowest drift. The ore-shoot is 120′ long and dips to the N.E. The ore is run down by a tramway 360′ long to the 16-stamp water-power mill, with stamps of 850 lbs. each, power being obtained by a hurdy wheel. Edmund Sheffield and Estate of E. R. Sheffield, of Sawyer's Bar, owners.

U. S. Mine (Drift).—See Kellner, Doescher & Mahr.

Varga's Mine (Placer).—It lies on Eddy Gulch, 3 miles S. of Sawyer's Bar, at 3,100′ elevation. The claim is worked by ground-sluicing; bowlders being removed by hand derrick. Frank Varga, of Sawyer's Bar, owner.

Vivian Mine (Quartz).—See Schroeder.

Volcano Mine (Quartz).—See our XIIth Report, p. 293. It is situated on Evans Gulch, in Quartz Valley, at 3,200′ elevation. The 200′ tunnel on the vein shows 8″ of quartz, lying between porphyry walls. C. A. Sargent, of Fort Jones, owner.

Walker Mine (Placer).—It is situated at the junction of Humbug and Cayuse creeks. It is worked from a small reservoir, with water from Cayuse Creek, by one man. William B. Walker, of Yreka, owner.

Way Up Mine (Quartz).—See Schroeder.

Welker Mine (Hydraulic).—It lies on Grouse Creek, 6 miles E. of Callahan, at 4,050′ elevation, and contains 40 acres. Water is derived from Grouse and Carmen creeks through a ditch 2¼ miles long, built on a grade of 12.8′ per mile, and delivered under 250′ pressure to a No. 2 giant by 1,000′ of 8″ pipe. The sluices are 30″ wide, 300′ long, and have a grade of 8″ per box. Welker Sons, of Callahan, owners.

Wells Mine (Placer).—It is on Horse Creek, 16 miles N.W. of Oak Bar, at 2,330′ elevation, and contains 20 acres. Worked by ground-sluicing in the creek-bed. A. Wells, of Oak Bar, owner.

Whistlehear (*Barry & Co.*) *Mine* (River).—See our XIIth Report, p. 277. This is in the bed of North Fork River, 2 miles below Sawyer's Bar, and comprises 23 acres. Bedrock lies 6′ below water-level, and the bar of gravel is 20′ deep. A derrick, with 66′ boom, raises the material to the sluices. Two overshot wheels, 12′x 2½′, furnish power for a Chinese pump and the reel, water being taken from the river by a 3′x 15″ flume, 1¼ miles long. The sluices are 15″x 15″, with pole riffles, and are set on a grade of 5″ per box. Barry, James & Blake, of Sawyer's Bar, owners.

White's Mine (Placer).—It lies on Little Humbug Creek, 3½ miles E. of Walker. The claim contains 40 acres, and is worked by ground-sluicing. Harry White, of Walker, owner.

White Elephant Mine (Quartz).—It is situated on White's Gulch, 6 miles S. of Sawyer's Bar, at 4,140′ elevation. The 4′ ledge of quartz is exposed by several open cuts. Smith & Eveleth, of Sawyer's Bar, owners.

Wilke's Mine (Placer).—This lies in Russian Creek, 9 miles N.E. of Sawyer's Bar, at 2,970′ elevation, and embraces 20 acres. The mine is worked by ground-sluicing, water being obtained from the creek, through ½ mile of ditch. Wilke Bros., of Sawyer's Bar, owners.

Wilkinson's Mine (Placer).—It is on North Fork of Salmon River, 3 miles above the Forks, at 1,600′ elevation, and contains 20 acres. Water for ground-sluicing is obtained from small tributaries. Wilkinson, Campbell, et al., of Forks of Salmon, owners.

Willard & Hickman Mine (Hydraulic).—See our XIIth Report, p. 294. This is on Klamath River, ½ mile below Hamburg Bar, at 1,910′ elevation, and contains 20 acres. Water is taken from Max Creek by a ditch 4′ wide, 2′ deep, and ½ mile long, and delivered through 800′ of 11″ to 20″ pipe to the giant, under 200′ pressure. The sluices, 300′ long and 20″ wide, are provided with block riffles, and have a grade of 8″ per box. The claim lies on the second bench, 150′ above the river. Willard & Hickman, of Hamburg, owners.

Willheim Mine (Placer).—See our XIIth Report, p. 294. It lies on North Fork of Wildcat Creek, 5 miles W. of Callahan, at 3,980′ elevation, and is worked by ground-sluicing. W. A. Willheim, of Callahan, owner.

Williams Mine (Drift).—This lies on Horse Creek, 13 miles N.W. of Oak Bar, at 2,120′ elevation, and contains 20 acres. It is worked by drifting in the bank of the creek. S. H. Williams, of Oak Bar, owner.

Williams Mine (Hydraulic).—See our XIIth Report, p. 294. It is situated on Salmon River, 6 miles below the Forks, at 970′ elevation, and embraces 20 acres. A No. 1 giant, under 150′ pressure, is supplied by 700′ of 11″ pipe and a mile of ditch, water being obtained from Louis Creek. The sluices have a 6″ grade, and are 24″ wide. Louis Williams, of Forks of Salmon, owner.

Wilson Mine (River).—It is at the mouth of Deadwood Creek, 10 miles N. of Fort Jones, and embraces 20 acres in the bottom of the valley. Bedrock lies 14′ below the surface, and the gravel is hoisted by a whim. The diggings are drained by a 6″ pump rigged to a small water-wheel. F. L. Wilson, of Fort Jones, owner.

Windsor Mine (Drift).—This is on Slide Creek, 5¾ miles S.W. of Callahan, at 4,900′ elevation, and contains 20 acres. It is worked by drifting in the bank of the creek. Dan Wilson et al., of Callahan, owners.

Wingate Hill Mine (Hydraulic).—See our XIIth Report, p. 294. It lies on Klamath River, 9 miles below Happy Camp, at 1,580′ elevation. There are 2,300′ of 11″ and 15″ pipe and a No. 2 giant on the claim. The sluices are 20″ wide, have a grade of 8″, and are paved with block riffles. The ditch is 3′ wide, 2′ deep, 7 miles long, and takes water from Oak Flat Creek. The bank is 80′ high, with 50′ of gravel. Horace Gasquet, of Happy Camp, owner.

Wood Bar Mine (Placer).—See our XIIth Report, p. 294. It is situated on Klamath River, 5 miles above Happy Camp, at 1,400′ elevation. Bedrock lies 10′ below water-level. Idle. James Camp, of Fort Jones, owner.

Wood Mine (Drift).—See our XIIth Report, p. 294. This lies on Klamath River, 6 miles below Seiad, at 1,560′ elevation, and is worked by drifting in the bank of the river. W. H. Wood, of Seiad, owner.

Wood & Fehely Mine (Hydraulic).—It is on Klamath River, 2 miles below Seiad, at 1,660′ elevation, and contains 60 acres. Water is obtained from Portuguese Creek by a ditch 1½ miles long; 500′ of 11″ pipe and a No. 4 giant, under 180′ pressure, are used. The bank of gravel is 40′ high. The sluices are 300′ long, 22″ wide, and are set on a grade of 6″ per box. Wood & Fehely, of Seiad, owners.

Wright & Fletcher Mine (Hydraulic).—See our XIIth Report, p. 294. It is at Oro Fino, at 2,900′ elevation, and contains 40 acres. The bank is 35′ high, and shows 20′ of gravel; the bedrock is a soft micaceous slate. The equipment consists of 1,500′ of 22″ pipe, a No. 1 giant with 2″ nozzle, under 180′ pressure, and 1,500′ of 5′ sluices, with block riffles. A hydraulic elevator raises the gravel 25′ from bedrock into the sluices. Headlights are used to illuminate the mine at night. About 3,000 inches of water is obtained from Kidder Creek by a ditch 7′ wide, 3′ deep, and 4½ miles long, and having a grade of 12.8′ per mile. Wright & Fletcher, owners; Hank Wright, of Fort Jones, superintendent.

Yellow Jacket Mine (Quartz).—It is a new location, and lies on Barkhouse Creek, 7 miles W. of Walker, at 3,470′ elevation. It adjoins the Commodore Mine. A 15′ open cut discloses a vein with 15″ of quartz, dipping 40° S.W. Otto Hipler et al., of Oak Bar, owners.

MILLS IN SISKIYOU COUNTY.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of Each, in Lbs.	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
					No.	Character.	No.	Capacity.		
Amazon	Water	10	850	24						
Ampback	Water	5								
Bonanza	Water	5								
Black Bear	Water	16	640	17	4	Frue				
Bloomer	Water	5	650							
Boyle*	Steam	4								
Caribou	Water	2	400	1½						
Columbia	Water	10	750							
Comstock No. 2	Steam	5	400	6¼						
Daggett & Smith	Water	5	550	7½						
Empire	Water	5	750	7						
Evening Star	Water	4	700	6						
Gilta	Water	4	650	6						
Golden Ball	Steam	20	650							
Golden & Eveleth	Steam	4	750							
Green Mountain	Steam	5								
Hartstan	Water	5								
Hegler	Steam	5	600	5						
Highland	Water	2								
Hook Him	Steam	10	800	25	2	Frue				
Hooper's "Custom"	Water	5	500	3¾						
Hungry Hill	Water	4		3⅓						
Jumbo	Water	10								
Knownothing	Water	4	650							
Last Chance	S. and W.	5	700	10						
Low Hill	Water	4	650							
Luna	Water	4	550	3						
Methodist Creek	Water	1	250	¾						
Mount Laurel	Water	16	650	20						
Oregonian	Water	2	850	1½						
Oro Fino	Steam	5								
Osceola	Water	5	850	8						
Quartz Hill	Water	10	750	12						
Schroeder	Steam	10	800	26	2	Frue				48 sq. ft.
Scott Bar	Water	10	750	20						

Short	Water	2	650							
Siskiyou	Steam	4	600							
Sterling	Steam	10	750							
Uncle Sam	Water	8	850							
Warren & Green	Water	5	650	7½						

In addition to stamps the mills marked with a * have additional crushing capacity, as noted in the following list:

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN SISKIYOU COUNTY.

Name of Mill or Mine.	Power.	Number	Character.	Diameter	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
						No.	Character.	No.	Capacity.		
Banner	Water		Arrastra		1½						
Bender	Water		Huntington								
Boyle		1	Huntington	3′							
Cannon	Water		Arrastra								
Carey	Water		Arrastra		1¼						
Challenge	Water		Arrastra		1¼						
Commodore	Water		Arrastra		5						
Goodenough	Water		Arrastra		2½						
Hiyon	Water		Arrastra		1¼						
Little Queen	Water		Arrastra		1½						
Queen		2	Arrastra	10′							
Roberts	Water		Arrastra								
Sterling	Water		Arrastra		1¼						
Tiger	Water		Arrastra		1½						

Sonoma County.

This county lies north of Marin County, and facing the ocean. It contains a large area of very fertile farming land, and is well watered by the Sonoma, Petaluma, Santa Rosa, and Russian rivers. Quicksilver, iron ore, aragonite, coal, chromic iron, etc., are found in commercial quantities. In the southern part of the county occurs a hard, dark-colored basalt, which is extensively used for the manufacture of paving-blocks, more than 2,000,000 being sold annually.

Silver Queen (Quartz).—This lies on Austin Creek, 5 miles N. of Cazadero, at 1,520′ altitude. It embraces the *Leopard* and the *Silver Queen* claims. The vein matter, a diabase dike in schistose rocks, is 30′ thick, and carries gold in pyrite. A 100′ cross-cut tunnel was run 100′ below the croppings. In the face, a soft, wet clay was struck, which could not be timbered successfully. Another tunnel, 150′ below the former, was then started, and is now 230′ long. It is estimated that 30′ more will cut the vein. Isaac Gray, of Healdsburg, owner.

MILLS IN SONOMA COUNTY.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of Each, in Lbs.	Capacity per 24 Hrs., in Tons.	Concentrators.
Indian Metallic Red Paint	Steam	10	850	5	(3 sets burr stones.)

Sutter County.

This is preëminently an agricultural and horticultural county, and its mineral industries are of very little importance. The soil is sandy loam on the eastern side, changing to dark, heavy clay westward, and yields large crops of grain and fruit, without irrigation. The greater part of the county possesses an inexhaustible supply of subterranean water, which may be obtained by pumping from wells 25′ to 100′ in depth. Natural gas has been struck in a number of shallow wells about Yuba City, but is not utilized, and no deep wells have been bored to test the supply. Clays suitable for brick-making occur in the valley as superficial deposits, and trachytic lava, suitable for rough masonry and macadam, is found at the Marysville Buttes. Prospecting has been done thereabouts for gold and coal, with indifferent success. The county has the advantage of shipping both by water and by rail.

Gold has been mined to a limited extent from places in ravines at the Marysville Buttes. Enough is said to have been obtained, when water was plentiful, to yield wages to the miners. There are no recent developments. See our Xth and XIth Reports, pp. 691 and 471.

Trinity County.

Ack Chung Mine (Hydraulic).—It is a Chinese company, working ground situated in Weaver Basin, about 1½ miles S.W. of Weaverville, adjoining the Souden claim, whose waste-water they pick up and use. Ack Chung Co., of Weaverville, owners.

Ah Lin Mine (Placer).—It is on New River, 2 miles below Francis, and contains 20 acres, lying at 1,590′ elevation. Worked by ground-sluicing. Ah Lin, of Francis, owner.

Alaska Mine (Quartz).—It is 7 miles N. of Coleridge, at 2,700′ altitude, and contains six locations with parallel veins between slate walls, carrying an average width of 2½′ of quartz of a ribbon structure, with copper sulphides; they all trend N.E., and dip about 60° S.E. A cross-cut tunnel has been driven 100′ to the main vein and drifted both ways an equal distance, giving 100′ of backs. A winze sunk 36′ on the north end of the drift shows a 4′ vein on the bottom. The quartz is reduced in a 13′ arrastra, driven by a 30′ overshot wheel, with water from Yellow Jacket Gulch; after leaving the arrastra the pulp passes through 567′ of 12″x 24″ sluices, set on a 2″ grade per box. W. F. Junkans, C. Junkans, and P. Luella, of Weaverville and North Fork, owners.

Amy Balch Mine (Quartz).—It is on Thorn Gulch, 1 mile S. from Deadwood, at 2,100′ approximate altitude, and comprises three locations on a porphyritic belt, traversed by numerous quartz seams, varying in width from a seam to 5′, and carrying auriferous sulphurets. This belt, about 100′ wide, lies in slate, and trends E. and W. At a distance of 30′ and 55′ apart, three tunnels, each about 100′ long, have been driven from Thorn Gulch into the porphyry; the ore when extracted is sacked and rolled down the hillside to a 9′ arrastra, driven by an 18′ overshot wheel, using the tailings water from the Brown Bear mill, and crushing 2 tons per day. Thorn Bros., of Deadwood, owners.

Anderson Mine (Placer).—It lies on Trinity River, 10½ miles above China Flat, and contains 20 acres, lying at 825′ altitude. Worked by rocker. Charles Anderson, of Burnt Ranch, owner.

Antone Mine (Hydraulic).—It is on New River, 3 miles below Francis, and contains 20 acres, lying at 1,620′ altitude. The water is taken from a little gulch and collected in a small reservoir. The bank is 30′ high, and all gravel; 100′ of 7″ hose delivers the water to a 2″ nozzle, under 50′ pressure. José Antone, of Francis, owner.

Applegate & McCulley Mine (Placer).—It is situated at the mouth of Fischer Gulch, 3 miles S. from Dedrick, at about 400′ elevation, and comprises 20 acres on a portion of the old channel of Cañon Creek. Worked by ground-sluicing through 8 boxes, 12″x 14″, set on a 5″ grade, and lined with Hungarian and slat riffles. Water is derived from Fischer Gulch. Applegate & McCulley, of Dedrick, owners.

Armstrong Mine (Quartz).—It is on Slide Creek, at New River City, at 4,600′ altitude. The vein is 9″ wide and courses N.W., with a dip of 20° N.E. Considerable surface work was done, which is now caved. Idle. Miller & Son, of Denny, owners.

Badgely Mine (Quartz).—It is on Grizzly Creek, a tributary of the North Fork of Trinity River, 18 miles N. of Coleridge, at 4,160′ altitude. It is a new discovery. A 10′ open cut exposes a 10″ quartz ledge. Badgely Bros., of Coleridge, owners.

Bailey Mine (Quartz).—It is situated on Fischer Creek, 4 miles S. from Dedrick, at about 2,600′ elevation, and comprises three full claims. There is small vein, from 6″ to 18″ in width, between slate and diorite, trending N.E. and dipping S.E. The development consists of a shaft and 100′ tunnel. G. Bailey, of Dedrick, owner.

Bald Point Mine (Hydraulic).—See Paulsen & Hughes.

Bartred Mine (Quartz).—See our VIIIth Report, p. 638. It is in Deadwood Mining District.

Bates Mine (Hydraulic).—It is 3 miles S.W. from Lewiston, at about 1,800′ altitude, and contains 100 acres on a low bar of Trinity River. The gravel bank is 20′ deep, and is worked with a No. 4 giant with 6″ nozzle; the water being delivered through 700′ of 15″ to 13″ pipe and under 60′ pressure. The water (second right) is obtained from Grass Valley Creek, and is conveyed through 3 miles of ditch, 8′ on top, 5′ on bottom, and 3′ deep, with a capacity of 300 miner's inches. The tail-flume is 500′ long, 4′ wide, paved with wooden blocks, and dumps 20′ into Trinity River. Owned and worked by 10 Chinese.

Bates & Tourtellote's Mine (Hydraulic).—This is on the west bank of the East Fork of Stewart's Fork of Trinity River, 3 miles N. of Minersville, and contains 40 acres. The bank is 60′ high and shows two distinct qualities of gravel; the upper portion carries coarse, bright gold, while the lower carries a black scaly gold. Water is taken from the Meade ditch. Bates & Tourtellote, of Minersville, owners.

Begel & Day Mine (Hydraulic).—It is situated on Cañon Creek, ½ mile S. of Dedrick, at 1,950′ altitude, and consists of a front and back gravel channel. Work was carried on in the former during the past season with the aid of an extension water-power derrick, with 90′ boom, to handle large bowlders. The 45′ bank of gravel is attacked with one giant, using 1,200 inches of water through 700′ of 15″ and 13″ pipe, and 4″ and 5″ nozzles, under 250′ pressure. The water comes from the East Fork of Cañon Creek through two ditches, each about 1¾ miles long, 3′ wide, and 2′ deep, and may be delivered under 800′ head. The tail-flume consists of 14 boxes, 12′ long, 4′ wide, and set on a 7″ grade; they are paved partly with riffles and wooden blocks, and dump into Cañon Creek. The gold is medium coarse, and is cleaned from the boxes every two weeks. Seven men are employed. T. Begel and J. Day, of Junction City, owners.

Berger Mine (Hydraulic).—It is on Cañon Creek, 5 miles S. of Dedrick, at 1,700′ altitude, and contains 200 acres, covering portions of the former channel of Cañon Creek. The gravel bank is from 50′ to 60′ high, the lower 12′ constituting the pay; the working-pit is 50′x 80′x 125′, and has a bedrock sluice and 8 boxes of 4′x 3′ flume, which dump 60′ into Cañon Creek. This flume is set on a 10″ grade, and lined with riffles and blocks. The coarse gold rarely gets below the third box. The claim is supplied with water from Gwinn and Rarick gulches, through three ditches, known as the Empire, 2½ miles long; the Eagle, 1¾ miles, and the Rarick Gulch, 1½ miles long; each being about 2′ wide on the bottom, 18″ deep, and with grades varying from ½″ to 1⅝″ per rod. The water is delivered through 800′ of pipe under 175′ pressure, and the water season lasts from December to July. Three men are employed. Berger Estate, of Junction City, owner.

Big Bar Mine (Hydraulic).—It is on Trinity River, at Big Bar, at 1,320′ altitude, and comprises 40 acres. Water is taken from Deer

Creek by a ditch 2 miles long. A No. 1 giant, under 80′ pressure, and 500′ of 8″ pipe, are in use. The bank is 40′ high, with 20′ of gravel. The sluices are 24″ wide. W. A. Paterson, of Big Bar, owner.

Big French Bar Mine (Drift).—It is on Trinity River, 1½ miles above Taylor Flat, at 1,340′ altitude. The tunnels are made in the bank of the river, above water-level. Warren, Van Winkle & Co., of Big Bar, owners.

Black Crow Mine (Hydraulic).—It is 1 mile E. of Douglas City, and consists of 300 acres of an old channel. Water is taken from Indian Creek through a ditch 9 miles long, 3½′ on bottom, 6′ on top, and 2½′ deep, with a grade of ⅜″ to the rod, and having a capacity of 1,500 miner's inches. Two men are driving a tunnel through the rim rock for an outlet. J. Bowie, of Weaverville, owner.

Blakemore Mine (Hydraulic).—It is on a bar of Trinity River, 5 miles N.E. from Lewiston, at 1,800′ elevation, and contains 225 acres. The gravel bank is from 15′ to 30′ deep, and carries coarse and scaly gold in the loose gravel. The water is taken from Baker's Gulch through two ditches, ½ and ¾ mile long, 18″ wide on the bottom, 3′ on top, and 18″ deep, and delivered under 150′ pressure. The water season is usually six months. Mrs. Blakemore, of Lewiston, owner.

Bloss & McClary Mine (Hydraulic).—See our Xth and XIIth Reports, pp. 699 and 307. It is situated in Sec. 5, T. 36 N., R. 7 W., near Trinity Center, at 2,300′ altitude. During the past season only ¼ acre of ground was worked off, with 5 men on one shift. Bloss & McClary, of Trinity Center, owners.

Blue Jacket Mine (Quartz).—It lies W. of the Trinity River, 1½ miles N.W. of Carrville, at 2,600′ elevation, and embraces two full claims. The vein, averaging about 6′ in width, follows the contact between serpentine and porphyry. It trends N.E. and dips about 45° N. The quartz is low-grade. The 50′-wide serpentine belt penetrates the porphyry, and carries quartz along both sides of the contact. A shaft, 4′x 4′ in the clear, has been sunk 40′, and two cross-cuts driven 75′ and 200′ long, to cut the vein. Water-power can be had from Coffee Creek. G. L. Carr, of Carrville, owner.

Bodecker Mine (Placer).—It is on Grizzly Creek, 17½ miles N. of Coleridge, at 4,050′ altitude. The claim comprises 20 acres, and is worked by ground-sluicing. — Bodecker et al., of Coleridge, owners.

Boles Mine (Placer).—It lies on Quinby Creek, a tributary of New River, 7 miles S. of Francis, and contains 20 acres, at 1,720′ altitude. Worked by ground-sluicing, water being derived from Quinby Creek. Boles & Lundberg, of Francis, owners.

Bonanza Mine (Quartz).—It is in Digger Gulch, ¾ mile from Minersville, at 2,300′ altitude, and contains two claims. The vein, about 3′ wide, strikes N.W., and dips 35° N.E., in slate. The vein is richest where it carries calcite, while the quartz generally is low-grade and carries a small percentage of copper sulphide. Some extremely rich specimens of gold-bearing calcite have been taken from this vein. There are two incline shafts; the deeper is 98′, and shows 3′ of quartz in the bottom. At 70′ a short drift proved that the pay-shoot dipped away from the shaft. Along the side of the gulch several tunnels have been driven into the hill, at different levels, some of which have developed gold-bearing quartz. J. H. Tourtelotte, of Minersville, owner.

Bonanza Mine (Quartz).—See Cleveland Consolidated, and our XIIth Report, p. 307.

Bonanza King Consolidated Mine (Quartz).—It is on a high ridge, 9½ miles N.E. from Trinity Center, at 6,600′ elevation at the upper, and 6,300′ at lowest, works. The vein trends N.W., and dips N.E. into the mountain, between porphyritic walls, and varies from 30″ to 5′ in width. The quartz carries iron, copper, and lead sulphides, with coarse free gold. Owing to the favorable location, four tunnels have been started on the slope of the mountain, 150′ apart; the three upper ones are little more than open cuts from 12′ to 15′ deep; the lowest is a tunnel 128′ on the vein. Upon the mill site, 5,500′ from the mine and 1,900′ vertically below the tunnel, a 5-stamp mill has recently been erected, to run by both water and steam power; the former acts on a 6′ Knight wheel under 300′ pressure, and the water is taken from Cedar Creek by ¼ mile of ditch, with a grade of 5″ to the rod. Eight men are employed. — Volmers et al., of Trinity Center, owners.

Boomer Mine (Quartz).—It is on Slide Creek, ½ mile S.E. of Denny, at 4,850′ elevation. The ground has been stoped 200′ in depth, and allowed to cave. For several years this caved material has been run through sluices, and some gold obtained from it. At present the property is leased, and a tunnel is being driven, with a view of finding the vein. In October, 1895, it was 230′ long, and still in caved ground. The vein is said to be 12″ thick, to dip 40° N.E., and to strike N.W. and S.E. A 3-stamp mill, with 450-lb. stamps, driven by an overshot wheel, belongs to the property. T. J. Ladd, of Denny, owner.

Boyd Mine (Placer).—It lies on Emigrant Creek, 4 miles S.W. of New River City, at 3,710′ elevation. A 3′x 2′ ditch, ½ mile long, conveys water from Emigrant Creek to a small reservoir. The claim contains 20 acres, and is worked by ground-sluicing. A. Boyd, of Denny, owner.

Brizard Mine (Quartz).—It is at the head of Eagle Creek, ½ mile N. of Cœur, at 4,450′ altitude. The vein is 8″ thick, and lies between diabase walls. The developments consist of a 200′ cross-cut tunnel, and at its end a winze on the vein, 100′ deep. The dip is 45° N.E., and the strike N.W. and S.E. A 2-stamp mill, with 400-lb. stamps, and driven by an overshot water-wheel, belongs to the property. A. Brizard, of Arcata, Humboldt County, owner.

Brown Mine (Placer).—It is on Coffee Creek, about 6 miles N.W. from Carrville, at 3,000′ elevation, and consists of 80 acres along the creek. The claim is just being opened, using water from Coffee Creek, through a ditch ¼ mile long, 3½′ wide on bottom, and with a grade of 3″ per rod. The loose gravel is run off by ground-sluicing through 13 boxes, 2′ square, set on 1½″ grade, and paved with blocks. Bedrock has not been reached yet. Two men are employed. — Brown et al., of Carrville, owners.

Brown Mine (Placer).—This is on Emigrant Creek, 3½ miles S.W. of New River City, at 3,670′ elevation. The claim is worked by ground-sluicing, water being derived from Emigrant Creek. L. Brown, of Denny, owner.

Brown Bear Mine (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 639, 713, and 308. It is situated at Deadwood, at 3,600′ elevation, in the center of an extended mineral belt, with a general E. and W. trend, and comprising 200 acres. The two principal claims, the *Last*

Chance and the *Monte Cristo*, are about 120′ apart, gradually diverging going west, dipping about 75° N., and crossing slate, porphyritic granite, and lime formations. The quartz carries lead, zinc, copper, and arsenical pyrite in connection with lime. Some of the ore-shoots are of high grade, especially where the fissures traverse the porphyritic granite; in passing through the slate belt the quartz is of a lower grade. The principal ore-shoot is on the Last Chance, and it has been followed 1,800′; the shoots on the Monte Cristo are shorter, but of higher grade. The mine has been worked through an extended system of tunnels, as well as through a 4′x 6′ (in the clear) two-compartment shaft, to a depth of 300′ perpendicularly. The deepest workings are 700′ in perpendicular depth, showing good pay-ore in the bottom. Only the higher grades have been extracted, leaving considerable bodies of low-grade ore (said to average $5 per ton) throughout the old works. Over 12 miles of tunnels and drifts have been driven; one of these passes through the entire ridge from Mill to Doliffe Gulch, on the Last Chance vein. From the lowest level the ore and water are raised 200′ by steam-power to the tunnel on the mill level. A tunnel, that would be about 1,500′ in length, could be run, and would tap the vein 200′ below the present works, or 400′ below the mill tunnel, and thus afford more economical working, a new mill being built at its mouth, or the old one moved. Twenty men are employed in the mine and ten in the mill; besides, there are five crews of tributers working on the Monte Cristo and four crews on the Last Chance vein. Mrs. H. Martin and C. H. Watts, of San Francisco, and J. Melton, of Placerville, owners; C. Dobler, of Deadwood, superintendent.

Buck's Ranch Mine (Quartz).—It is 3 miles E. of Dedrick, at 2,700′ altitude. The vein trends N.E. and S.W., and dips S. It is prospected through two tunnels on the vein; the upper being 300′, and the lower 90′ long. There are two Huntington mills, 3½′ and 5′, run by a 6′ Pelton wheel, with water taken from North Fork of Big East Fork of Cañon Creek. Mason & Thayer, of Douglas City, owners.

Bully Choop Group (Quartz).—See Cleveland Consolidated.

Bully Choop (*Occidental and Original Bully Choop*) *Mine* (Quartz).—See our VIIIth and XIIth Reports, pp. 640 and 308. These claims are located on the northwest side of Bully Choop Mountain, 20 miles S. of Ono, at 6,000′ elevation. Since our last Report no developments have been made; experiments with methods of working the ores resulted in nothing definite. There is a 3-stamp mill, with 850-lb. stamps, an 8½′ arrastra, and one Triumph concentrator, working 6 tons per day with a 15 H.P. steam-engine. Nine men are employed in the mine, three in the mill, and two teamsters. Frick & Davis, of Lewiston, owners.

Bunker Hill Mine (Quartz).—It is a prospect, near Lewiston, at 1,900′ elevation. The vein strikes N.E., and is said to contain cinnabar, besides gold. Mrs. Blakemore et al., of Lewiston, owners.

Canadian Bar Mine (Hydraulic).—It is at Taylor Flat, on Trinity River, at 1,200′ elevation. The claim lies on an old channel, 200′ above the river, and has a bank of gravel 25′ thick. A 3′x 2′ ditch, 1 mile long, to convey water from Canadian Bar Creek, is under construction. David Finch, of Natoma, Sacramento County, owner.

Carrie Mine (Quartz).—It is on Slide Creek, ½ mile N.W. of New River City, at 4,600′ altitude. The 10″ vein courses N.W. and S.E., and dips 25° N.E., between diabase walls. Considerable ore has been taken out from near the surface, but the mine is now idle. George Ferney, of Denny, owner.

Cedar Flat Mine (Hydraulic).—It lies on Trinity River, 10 miles below Taylor Flat, at 1,120′ altitude. Idle.

Chapman & Fischer Mine (Hydraulic).—See our Xth Report, p. 708. It lies in Secs. 19, 29, and 30, of T. 33 N., R. 10 W., about 6 miles from Junction City, at 1,900′ elevation, and comprises 138 acres. There are three benches of gravel, carrying the largest bowlders of any claim on the river. Some of the largest specimens of platinum found in this State came from this claim. Water from Soldier's Creek is used, and the season lasts about five months. Chapman & Fischer, of Junction City, owners.

China Creek Mine (Hydraulic).—It lies on New River, 12 miles below Francis, at 950′ elevation. The bank is 40′ high, with about 30′ of gravel, partly cemented next the bedrock. Water is taken from China Creek by a 3′x 2′ ditch 1 mile long; 900′ of 12″ pipe delivers it to a No. 2 giant, under 180′ pressure. The sluices are 30″ wide and paved with block riffles. W. J. Nichols, of Burnt Ranch, owner.

Chinese Gravel (*Coyle, Kong He Kong*) *Mine* (Hydraulic).—See our Xth and XIIth Reports, pp. 700 and 309. This is situated at the outskirts of Trinity Center, at 2,300′ altitude. The property contains over 76 acres on the benches of a former channel of Trinity River, with a general N.E. course. The bank is from 70′ to 90′ high; the lower 20′ is gravel; the remainder, red clay and soil, carrying a little fine gold throughout. One acre was washed during the past season, and 36 acres in all. Water is derived from Swift Creek through two ditches, the Bloss & McClary lower ditch, and a second smaller one below; these are 3 miles long and have a capacity of 1,200 miner's inches, which are delivered to a No. 3 giant with 5″ nozzle, under 80′ pressure, from a reservoir, through 1,300′ of 15″ to 11″ iron pipe. A derrick, with 60′ boom, is worked with a 16′ overshot wheel. The flume consists of 300 boxes, of 12′ each, 3′ wide, and set on a 2½″ grade per box, dumping into Trinity River. The water season lasts ten months. Seventeen Chinese work the claim. Ong Dean et al., of Weaverville, owners.

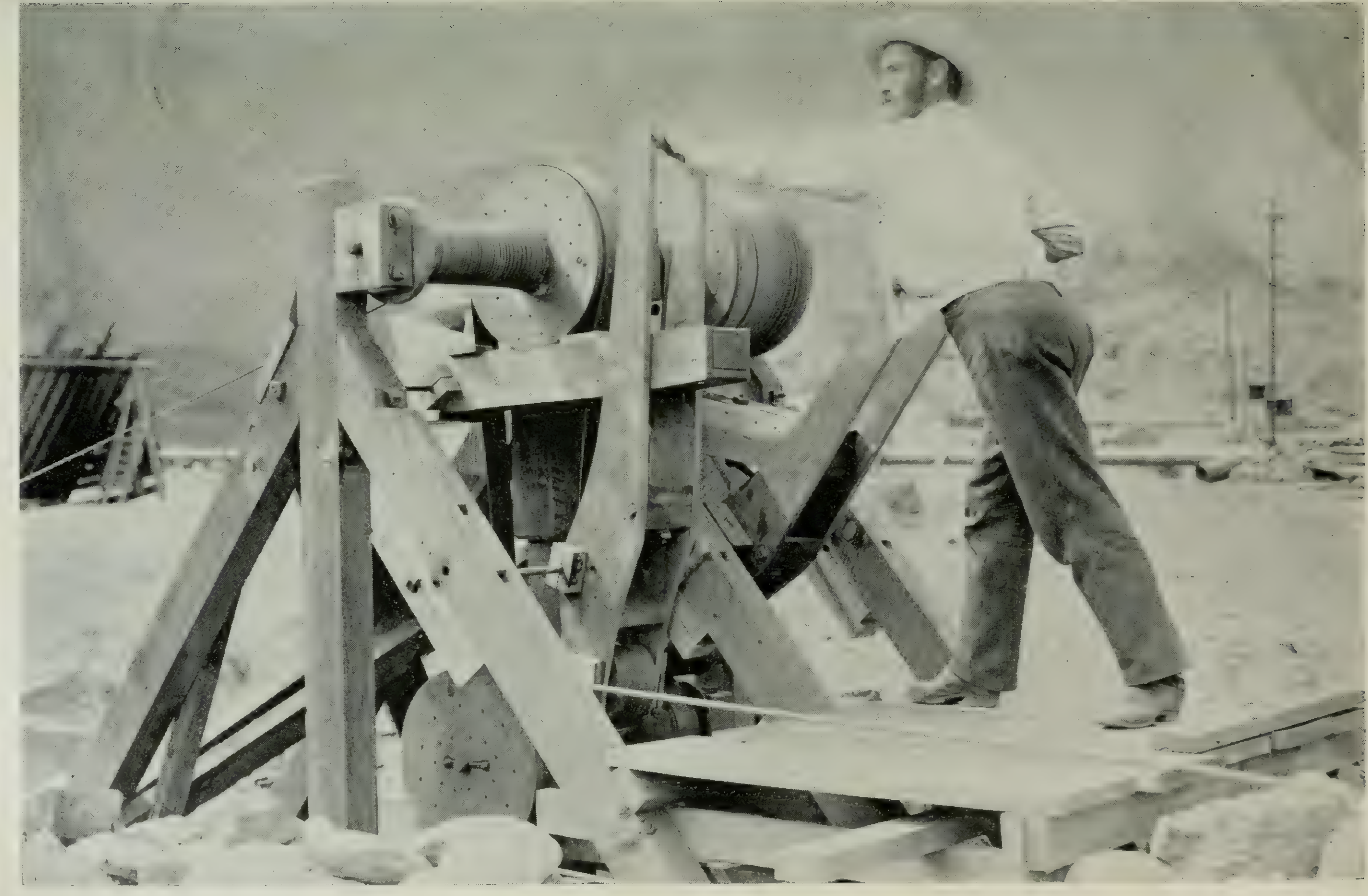
Chloride Mine (Quartz).—See our XIIth Report, p. 309. It is at the head of Cañon Creek, 2½ miles N.E. of Dedrick, at over 5,000′ elevation. Since our last Report, a new tunnel has been started at the west end of the claim, and is in at present 750′ on the vein. Four men are working. S. L. Blake, C. W. Smith, and H. R. Given, of Weaverville, owners.

Clark Mine (Placer).—It is on Pony Creek, 7 miles above Francis, at 2,070′ altitude, and contains 20 acres. Water for ground-sluicing is taken from Pony Creek. Clark & Borien, of Francis, owners.

Cleveland Consolidated (*Bully Choop*) *Group of Mines* (Quartz).—See our VIIIth and XIIth Reports, pp. 640 and 310. This property consists of two locations, which are situated on the southwest side of Bully Choop Mountain, at 5,500′ to 6,000′ elevation. Idle. R. G. Hart et al., of Hart, Shasta County, owners.

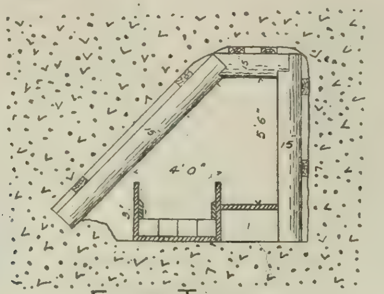
Clinton Mine (Placer).—It is on Emigrant Creek, 4½ miles S.W. of New River City, at 3,750′ elevation, and contains 20 acres. Water for ground-sluicing is taken from Emigrant Creek. William Clinton, of Denny, owner.

Columbia Mine (Quartz).—It is a prospect, near Lewiston, at 1,900′ altitude, with a N.E. vein. Mrs. Blakeman and H. Springstedt, of Lewiston, owners.



Conveyor Reels of Cie Francaise de Hydraulic.

Compagnie Française des Placers Hydrauliques de Junction City (Hayes & Pickett) Mine (Hydraulic).—See our Xth and XIIth Reports, pp. 704 and 308. This company's mine is situated 1 mile from and opposite Junction City, at 1,700′ elevation, and contains two benches of the former channel of the river, comprising over 1,300 acres. The upper bench is being worked in four or five pits, the giants being placed at the angles to avoid being caved upon; three are always in place, using 7″ and 8″ nozzles. The bank being very high, derricks cannot be used to remove the bowlders without great danger of being covered up and destroyed, consequently the bowlders were blasted, causing a heavy outlay for powder and labor, besides a rapid wearing of the wooden blocks. To reduce these expenses, the present manager devised and applied an ingenious use of blocks, cables, and a carrier or trolley to remove the bowlders from the face of the bank. Bowlders up to 2 tons in weight are picked up and conveyed to the back end of the pit. (See p. 445.) Between the Hayes & Pickett ground a new pit has been opened, with an outlet through a short bedrock tunnel. The usual method of timbering tunnels has been somewhat changed to reduce the amount of excavation and yet furnish sufficient height for a workman to walk along the flume, as shown in the cut The company has one of the finest water-rights in Trinity County, and 3,200 miner's inches of water are used. The main ditch from Cañon Creek is $8\frac{1}{2}$ miles long, $7\frac{1}{2}$′ wide on top, $4\frac{1}{2}$′ on bottom, and $3\frac{1}{2}$′ deep, with a grade of 9.6′ per mile. A suspension bridge carries the water in two pipes across Trinity River, and the ditch is being enlarged to a capacity of 6,000 miner's inches. Thirteen hundred inches of water for the Pickett claim is brought from McKinney and Mill gulches to a reservoir above the pit. The present pipe-line is 4,000′ long. Twice as much ground was washed in 1895 as in 1894. The entire pit is lighted with electric arc lights, the dynamo being driven by a 3′ Pelton wheel, which also furnishes the power to the windlass manipulating the trolley on the cable. The bedrock cut, carrying the flume, is lighted by 10 incandescent lights of 16 candle-power, supplied from the same dynamo. From 40 to 50 men are employed, the work being carried on night and day. A French syndicate, owner; Mons. Comenge, of Paris, France, president; E. Saladin, of Junction City, manager.



FLUME TUNNEL.

Coyle Mine (Hydraulic).—See Chinese Gravel.

Daisy Mine (Quartz).—It is about 4 miles N.W. of Lewiston, at 1,960′ elevation. The 1,500′ by 600′ claim carries three parallel veins trending

N. 35° E., two of them being nearly vertical; the third and most easterly dips 60° N.W., and toward the others. They vary from a few inches to 2′ in width, and lie between a quartz porphyry foot-wall and a slate hanging-wall, with occasional chloritic casing. The quartz carries a heavy percentage of suphurets, mostly iron, but with some zincblende and galena. On the first, or most easterly vein, 1″ to 2′ wide, the developments are a 150′ tunnel, a 50′ inclined shaft, and a 45′ vertical shaft below the tunnel. On the second vein above is a 14′ shaft, and on the third vein, still higher up the hill, is a 6′x 8′ perpendicular 50′ shaft. Two men are at work. Mrs. Blakemore and H. Springstedt, of Lewiston, owners.

Dannenbrink Mine (Hydraulic).—It is about 5 miles S. from Dedrick, at 1,960′ elevation, and contains 250 acres, including part of an old back channel, and on the front a bar of Cañon Creek, known as the Red Flat placer claim. On the bar portion of the ground some drifting is being done through two tunnels, 300′ and 125′ long. The bank of the main pit varies from 30′ to 100′ in depth, and is capped with 10′ of soil; the gravel carries a large percentage of bowlders. Water is derived from Gwinn Gulch through three ditches; 250 inches through a ½ mile ditch, 32″ wide on bottom, 2′ deep, and with a grade of 2″ per rod; 150 inches from the Eagle ditch, in which the claim owns a quarter interest; and the Rarick ditch, 1½ miles long, 2′ wide, and 18″ deep; delivering the water through 400′ of 9″ and 7″ pipe to a No. 1 giant, under 300′ pressure. Season lasts five months, and ¼ acre was worked the last year. Four men are at work. Dannenbrink Estate, of Junction, owner.

Dark Horse Mine (Quartz).—See Smith.

David Evans Mine (Hydraulic).—See our Xth Report, p. 705. This is part of the Red Hill property near Junction City, owned by Day & Begel, and since transferred to a French syndicate.

Deer Creek Mine (Quartz).—See Smith.

Diener Mine (Hydraulic).—See Minersville Hydraulic G. M. Co.

Dixon Mine (Drift).—It is situated on Rattlesnake Creek, 14½ miles N. of Coleridge, at 3,350′ altitude, and contains 20 acres. It is a bar on the bank of the creek, worked by drifting. John Dixon, of Coleridge, owner.

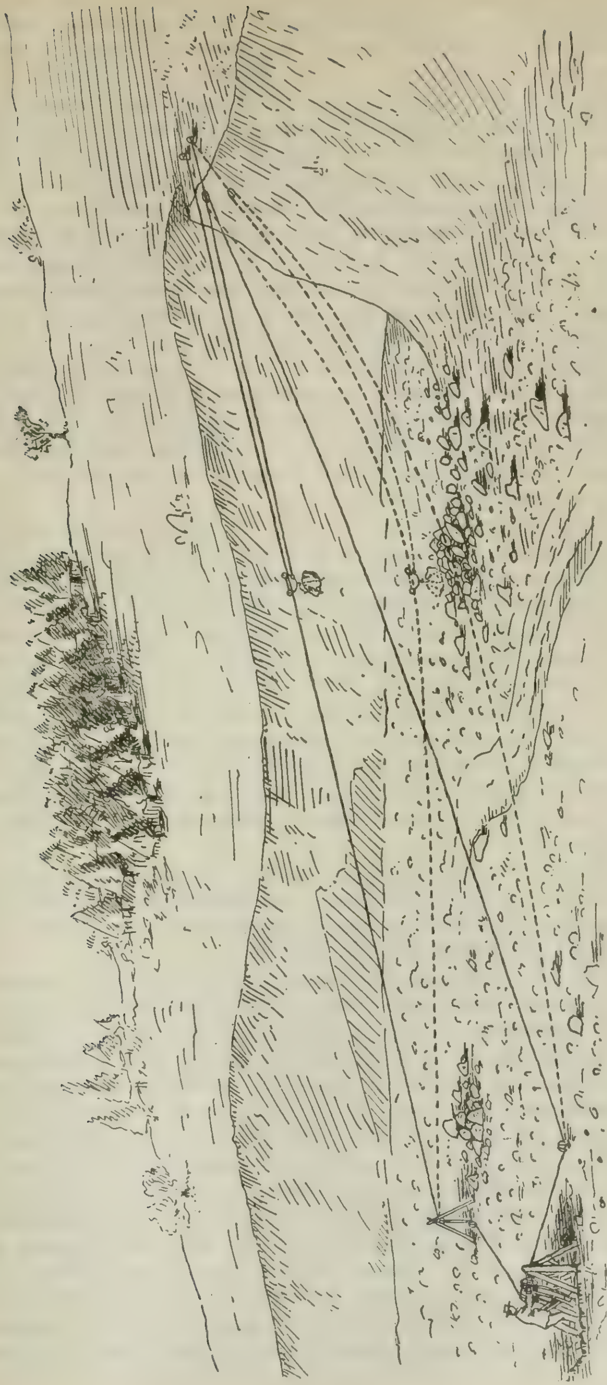
Dockery Mine (Placer).—See Ong Dean.

Don Juan Point Mine (Hydraulic).—It lies on Trinity River, 8 miles below Taylor Flat, at 1,200′ elevation. Water is taken from Don Juan Creek by a ditch, 1 mile long. A No. 1 giant, under 200′ pressure, and 850′ of 8″ pipe, are used. The bank is 45′ high, and all gravel. The sluices are 24″ wide, paved with block riffles, and set on a grade of 8″ to the box. W. Husted & Co., of Big Bar, owners.

Eastman Mine (Hydraulic).—See Jim Sing.

Ehni Mine (Drift).—It is on Rattlesnake Creek, 16 miles N. of Coleridge, at 3,450′ altitude. It is a bar on the bank of the creek, and contains 20 acres. John Ehni, of Coleridge, owner.

Emmet Mine (Quartz).—It is 1¾ miles N.W. from Deadwood, at 2,400′ elevation. The vein runs N. of E., and dips 75° N.; it is 4′ wide, between slate and porphyry walls, and carries galena and arsenical pyrite. It is worked through several cross-cut tunnels, and 187′ is the longest. A new one has been lately started, 230′ below the other workings. The claim is well supplied with timber, and employs 3 men. Shields Donohoe and G. Hollingsworth, of Deadwood, owners.



ROCK-CONVEYOR—COMPAGNIE FRANCAISE DES PLACERS HYDRAULIQUES.

Enterprise Mine (Quartz).—See our VIIIth Report, p. 643. This is situated 9 miles N.W. of North Fork, at 2,100′ altitude. The vein, 6″ to 2′ wide, courses N.W., and dips 20° E. Worked through a tunnel.

Evans Bar Mine (Hydraulic).—It is 5 miles S. of Junction City, at 175′ elevation, and consists of 100 acres on a bar and bench of Trinity River. The bank is 20′ high, of which 8′ is gravel and 12′ soil; the gravel contains some large bowlders. Evans Bar Creek furnishes the water through two ditches, ¾ and ½ mile long, supplying 800 inches under 175′ pressure. Two giants, with 5″ and 7″ nozzles, and two lines of 15″ pipe, 1,300′ and 900′ long, respectively, are used. The water season lasts eight months. There are two bedrock cuts, each 300′ long, with 300′ of 4′ and 3′ flumes, set on 7″ and 6″ grades, respectively, and paved with wooden blocks. The gold is both fine and coarse. Six men are employed. H. H. Carr & Son, of Junction City, owners.

Excelsior Mine (Quartz).—This is ¾ mile S.E. of New River City, at 5,125′ elevation. There are five tunnels, from 100′ to 200′ long, through which the ore has been extracted. The vein is 8″ thick, and lies nearly horizontally between diabase walls. A 6-stamp mill, with 480-lb. stamps, driven by an overshot water-wheel, belongs to the property. Frank Colgrove, Jr., of Denny, owner.

Excelsior Mine (Quartz).—This is 15½ miles N.W. from Ono, Shasta County, in Sec. 9, T. 31 N., R. 8 W., at 5,560′ elevation. The vein, 1′ to 3′ wide, lies between slate walls, trends N. 20° E., and dips about 55° E. Two shafts, 5′x 5′ in the clear, and 60′ and 75′ deep, have been sunk on the vein; a 40′ tunnel also has been driven. The quartz carries a large percentage (sometimes as high as 10%) of a good grade of sulphurets, mostly iron and copper. The rock is reduced in a circular mill, similar to a Bryan roller, 6′ in diameter with four revolving disks, 2′ in diameter with 2″ tires, running on a 5″-wide flat steel ring, surrounded by a No. 4 (30-mesh) punched screen. The pulp discharges on a canvas apron leading to sluice-boxes, and 1 ton a day is crushed. The power is furnished by a horse. Two men are employed. J. T. Lockhardt and Murray Estate, owners.

Ferguson Mine (Placer).—It is on Trinity River, 9 miles above China Bar. It comprises 160 acres of nearly all gravel, lying at 840′ altitude. A ditch 1½ miles long is being dug to bring water from Sharpar Creek. S. Ferguson et al., of Burnt Ranch, owners.

Fischer Gulch and Bonanza Mine (Quartz).—This is a prospect, near the head of Fischer Gulch, on Cañon Creek, 9 miles N. from Junction City, at 2,600′ elevation. It contains two claims, with a vein coursing N.E., and dipping 50° to 70° S.E. between slate and diorite walls. A 100′ cross-cut has been run to the vein and drifts turned both ways on it for short distances; the north one connecting with a 60′ shaft. Three men are at work. S. L. Blake and H. R. Given, of Weaverville, owners.

Forget-Me-Not Mine (Quartz).—It is on the east side of Trinity River, 4 miles N.W. of Trinity Center, at 2,600′ elevation. It consists of two full claims on the same vein, which courses E. and W. (parallel to and 900′ S. of the Strode Mine), and dips 65° S., with an average width of 10″ in a porphyritic belt. Three tunnels have been driven: No. 1, on the vein, 15′; No. 2, a cross-cut to the vein, and turned on it 45′ east; No. 3, a cross-cut 85′ in length, needs extending 20′ to tap the vein. The quartz carries sulphurets, as well as hematite and black iron ore. The ore is sledded to the 9′ arrastra, 1 mile N.E. of Carrville, driven by a

32′ overshot wheel, with 20 inches of water obtained from Copper Creek through an 800′ ditch, during six months in the year. The arrastra may be run constantly by digging 1½ miles of ditch from Scorpion Creek. G. L. Carr, of Carrville, owner.

Fountain Head and Thanksgiving Mines (Quartz).—They are 5 miles S.W. of the town of North Fork, on the Trinity River, at about 2,400′ altitude, and embrace two claims. The vein, averaging 2′ in width, courses N. and S., and dips 20° E. between greenstone walls. There are five tunnels, one above the other, on the vein, the longest of which is about 200′. A 20 H.P. engine runs a 5-stamp mill, with 650-lb. stamps, dropping 6″ to 7½″, 95 times per minute, and crushing 6¼ tons per day. There are also four Frue vanners. H. Junkans, of Weaverville, owner.

Frick & Davis (*Henry Clay*) *Mine* (Quartz).—It is about 1½ miles N.W. of Deadwood, at 2,700′ altitude. The vein courses a little N. of E., and dips 50° to 70° N. The vein is about 4′ wide, within porphyritic walls; the quartz carries considerable sulphurets. Two tunnels have been driven; the upper one 250′, and lower one 400′ long; a 60′ shaft has been sunk below the tunnel level. The ground between tunnels is stoped for 150′ in length. At the mouth of the gulch on Deadwood Creek is an old arrastra belonging to the property, run by water taken from Deadwood Creek. Frick & Davis, of Lewiston, owners.

Gilzean Mine (Quartz).—It is a new prospect, situated in Deadwood, at about 3,400′ elevation. The vein, which crops out in Mill Gulch, trends E. and W., dips S. between porphyritic walls, and is about 2′ wide. Three short tunnels have been driven on the vein; the longest is 80′. The middle tunnel is being extended. C. E. Gilzean, of Deadwood, owner.

Globe Mine (Quartz).—See our XIIth Report, p. 310. It is 5 miles N.E. from Dedrick, at 5,500′ altitude. Since our last Report, the mine has been shut down, on account of litigation. Six men are preparing to resume active operations. R. Woodburn, of Dedrick, owner.

Gold Dollar Mine (Hydraulic).—See Paulsen & Hughes.

Gold Leaf and Great Eastern Mines (Quartz).—See our XIIth Report, p. 311. They lie 10 miles W. from Castella, Shasta County, and consist of two claims on a vein which trends N.W., and dips 45° S. between porphyry walls. J. N. White et al., of San Francisco, owners.

Golden Chest Mine (Quartz).—See our VIIIth Report, p. 641. It is on the East Fork of Trinity River, 15 miles N.W. of North Fork, at 2,600′ altitude. The vein, about 18″ wide, trends N.W., and dips 80° S.W. between slate and porphyritic walls. It is worked through three tunnels, 200′, 70′, and 120′ long, respectively. Belonging to the property is a 5-stamp mill, with 650-lb. stamps, and one Frue and one Triumph concentrator. The water-power is derived from the East Branch of the East Fork, through 1¼ miles of ditch, carrying 500 inches, and delivered on a 4′ Pelton wheel, under 100′ pressure. Four men are employed. Messrs. Drexler & Whittier, of San Francisco, owners.

Golden Gate Mine (Quartz).—It lies on Slide Creek, ½ mile N.W. of New River City, at 4,600′ elevation. The vein averages 10″ in width, and dips 15° N.E. between diabase walls. The development consists of a tunnel 150′ long on the vein; the ground above it is stoped. Idle. Gus Gutzen, of Denny, owner.

Good Friday Mine (Hydraulic).—See our XIIth Report, p. 311. It is 3 miles S. of Junction City, at 1,800′ elevation, and contains 80 acres on an old bench of Trinity River, with a bank from 60′ to 70′ high. The water is obtained from adjoining gulches; the water season is short. T. C. Post and T. E. Jones, of Junction City, owners.

Gray Eagle Mine (Quartz).—This mine is 3 miles N. of Centerville, at 3,500′ elevation. The vein courses E. and W., and dips about 60° S. between porphyry and slate walls, showing a 2′ vein of free-milling ore, without sulphurets. Two men are at work. F. Demick and P. G. Baker, of Trinity Center, owners.

Gray Mare Mine (Quartz).—See Smith.

Gribble Mine (Hydraulic).—See our XIIth Report, p. 311. It is 3 miles S. of Junction City, at about 1,800′ elevation, and comprises 80 acres. Idle since last Report. Mrs. Gribble, of Junction City, owner.

Grover Cleveland Mine (Quartz).—It is on Slide Creek, ½ mile W. of New River City, at 4,500′ altitude. There are an 80′ shaft, a 250′ crosscut tunnel, and some shallow surface workings. The vein is 8″ wide, stands vertically, and courses N.W. and S.E. Idle. Fred Loring, of Callahan, Siskiyou County, owner.

Haas Mine (Hydraulic).—See our Xth and XIIth Reports, pp. 703 and 311. It is 1 mile W. of Junction City, on the east side of Trinity River, at about 1,700′ elevation, and contains 160 acres. During the past year 4 acres of top soil have been stripped, leaving 5′ of gravel to be washed. The present ditch is to be enlarged. F. G. Haas, of Junction City, owner.

Halz Mine (Hydraulic).—This is on Quinby Creek, 6 miles E. of Francis, at 1,600′ altitude, and contains 23 acres. The water is furnished from a small tributary through a 2′ ditch ¾ mile long; 300′ of 7″ hose delivers the water to a 2″ nozzle, under 60′ pressure. The sluices are 24″ wide and the bank is 30′ high, and all gravel. Halz & Stabell, of Francis, owners.

Hansen Mine (Placer).—This is on Trinity River, 9½ miles above China Flat, Humboldt County, at 640′ altitude. Water for groundsluicing is derived from small, wet weather streams. J. Charles Hansen, of Burnt Ranch, owner.

Hardtack Mine (Quartz).—It is situated ½ mile N. of New River City, adjoining the Ridgeway Mine, at 4,750′ altitude. The vein is about 10″ wide, and dips 35° N.E. in diabase. The developments consist of an inclined shaft 200′ deep and 400′ of drifts. Idle. T. J. Ladd, of Denny, owner.

Hard Times Mine (Quartz).—It is on Slide Creek, at New River City, at 4,450′ altitude. A tunnel 60′ long and several open cuts disclose a vein of quartz 2′ thick, lying nearly flat. Fullmore & Miller, of Denny, owners.

Harvey Mine (Hydraulic).—See Sam Lee.

Haskins (*Hatchet Creek*, *Shoo-Fly*) *Mine* (Hydraulic).—It is situated on Hatchet Creek, ½ mile N. of Trinity Center, at 2,300′ altitude, and comprises 74 acres. The gravel bank is 24′ high and all gravel, which, being tight next the bedrock, requires powder to loosen it up. One quarter of an acre was worked the past season. There are two channels passing through this ground—the Hatchet Creek channel and the old Trinity channel. The gold is of the cucumber-seed variety. Water is obtained from Buckeye Creek through a 6-mile ditch, with a ¾″ grade per rod and a capacity of 300 inches, delivered through 600′ of 12″ and 10″ pipe to a No. 1 giant, using 1¼″ and 2½″ nozzles, under 125′ pressure, though 400′ may be obtained. The flume consists of 90 boxes, 5½′ wide, set on 1½″ grade, and paved with wooden blocks. The water season lasts six months. Three men are employed. A. P. Haskins, of Trinity Center, owner.

Hatchet Creek Mine (Hydraulic).—See Haskins.

Hawkins Bar Mine (Hydraulic).—This lies on Trinity River, 15 miles above China Flat, at 890′ altitude. Water is carried from Hawkins Bar Creek by 2 miles of ditch to a reservoir 2 acres in area. A No. 2 and a No. 3 giant, under 240′ pressure, are supplied by 2,400′ of 15″ pipe. The bank is 10′ to 80′ high, and the gravel is slightly cemented near the slate bedrock. The sluices are 24″ wide, and are paved with block riffles. The claim contains 368 acres and is patented. Jerry Smith, of Burnt Ranch, owner.

Hayes Mine (Hydraulic).—See Compagnie Française des Placers Hydrauliques de Junction City.

Haywood & Martin Mine (Drift).—It is situated on Trinity River, ½ mile above Taylor Flat, and comprises 20 acres of an old bar, lying at 1,310′ altitude. Haywood & Martin, of Big Flat, owners.

Headlight Mine (Quartz).—It is in Red Gulch, 3 miles N. of Trinity Center, and ½ mile E. of the Trinity River, at 3,450′ altitude. The vein strikes E. and W., dips 60° S., and shows gossan outcrop, 150′ wide, between porphyry and slate; the latter forming the foot-wall. A few open cuts have been made across the vein and a cross-cut tunnel has been driven 75′ toward the vein; 75′ more will reach the vein. Timber is plentiful. Three men are at work. F. Demick and P. G. Baker, of Trinity Center, owners.

Henry Clay Mine (Quartz).—See Frick & Davis.

Hidden Treasure Mine (Quartz).—It is on Slide Creek, 1 mile S. of New River City, at 5,200′ altitude. The developments consist of a 200′ cross-cut tunnel and a 60′ winze on the vein, which is 8″ wide; it lies between diabase walls, and dips about 45° S. Idle. Ladd & Irving, of Denny, owners.

Highland Bar Mine (Hydraulic).—It is at Taylor Flat, on Trinity River; at 1,800′ elevation, and comprises 45 acres. The location was made recently on an old channel half-way up on the side of the cañon. A 3′x2′ ditch, ¾ mile long, and with an 8′ grade, is being dug. The gravel is said to be very rich. Pelletrean & Hedges, of Big Bar, owners.

Himes Mine (Quartz).—It is on Deacon Creek, 19 miles N.W. of Trinity Center, at 3,400′ altitude, and contains three full claims. The 16″ vein courses N.W., and dips 75° N.E. between serpentine on the east and porphyritic rock on the west. The quartz is well mineralized and is reduced in a 10′ arrastra, ¾ mile distant, run by a 12′ overshot wheel and 30″ breast, with water from Deacon Creek. Some tunnels have been run on the vein. Three men are at work. W. H. Himes, H. W. Burner, and W. R. Patton, of Trinity Center, owners.

Hirschberger Mine (Placer).—This lies on Pony Creek, 8 miles above Francis, at 2,200′ elevation. Water for ground-sluicing is taken from Pony Creek. Jacob Hirschberger, of Francis, owner.

Hoboken and Grand Slide Mine (Hydraulic).—It is situated on New River, 1½ miles above its mouth, and at 1,100′ altitude. The bank is 30′, and the gravel 20′ high. Water is taken from Bell Creek through a 3′x 2′ ditch, 2½ miles long, with a 6′ grade. A No. 2 giant, under 175′ pressure, is supplied through 1,000′ of 12″ pipe. Many large bowlders occur in the gravel near bedrock. The claim embraces 60 acres. M. M. Johnson, of Francis, owner.

Hughes Mine (Hydraulic).—See Paulsen & Hughes.

Hunter Mine (Quartz).—It lies on Eagle Creek, 1 mile W. of Cœur, at 4,500′ elevation. There are several shallow openings, and a 220′ tunnel on the claim. The vein is 6″ thick, and dips 40° N.E. between diabase walls. Idle. T. J. Ladd, of Denny, owner.

Indian Gulch Mine (Hydraulic).—It is on an old channel, 9 miles S.E. of Douglas City, and contains 160 acres, 25 of which have been worked. The bank is 25′ to 30′ high. The gold is coarse. Indian Creek supplies the 900 inches of water used. Four men are employed. Anton Rogers, of Douglas City, owner.

Ingleside Mine (Hydraulic).—It is on a back bench of the East Fork of Stewart's Fork, 1 mile N. of Minersville, at 2,350′ elevation, and consists of 60 acres. The gravel is 30′ deep, with a very heavy percentage of rocks and bowlders. The upper layers carry quartz gold; the remainder carries a black, scaly gold, most frequent near the porphyritic bedrock. Water is obtained from the East Fork of Stewart's Fork through 6 miles of 2½′ ditch, having 1″ grade per rod and of 500 inches capacity, delivered, under 200′ pressure, through 700′ of 15″ and 11″ pipe to a No. 1 giant with 4″ nozzle. The water season lasts throughout the year. The outlet is through a 60′ cut in the bedrock, with 18 boxes of 3′ flume, paved with wooden blocks and set on a 9″ grade. Two men are at work. Dunn & Seward, of Minersville, owners.

Jacob Bros. (*Patterson and Low Bar*) *Mine* (Hydraulic).—See our Xth Report, p. 707. It is 3 miles W. of Junction City, at 1,450′ altitude, and contains 356 acres. This is on the same gravel channel as Red Hill, and contains very good ground, but suffers from a lack of water; the present supply comes from Connor Creek and two neighboring gulches, through 1 mile of ditch from each. These ditches are 3′ wide on top, 2′ on bottom, with a grade ½″ to the rod and a capacity of 500 inches, delivered, under 80′ pressure, to a No. 1 giant with 4″ nozzle. The water season lasts four months, in which time half an acre of ground is moved. The bank consists of 45′ of a capping of red clay and loam and 15′ of gravel; powder is required to blast the bowlders. The dump into Trinity River is through 800′ of a deep bedrock cut ending in 11 flume boxes, 4′ wide, set on an 8″ grade, and an undercurrent 6′ wide. Clean-ups are made monthly. Two men are employed. Jacob Bros., of Junction City, owners.

Jenkins Mine (Placer).—It lies on New River, 6 miles below Francis, at 1,480′ altitude, and is a new location. A ditch is being dug to furnish water. George Jenkins, of Francis, owner.

Jerusalem Mine (Quartz).—It is situated in Sec. 9, T. 31 N., R. 8 W., at the summit of Bully Choop Mountain, at 5,350′ elevation. The vein trends N.W., and dips N.E., between slate and trachyte. The vein has been cross-cut 30′ without reaching the opposite wall. Two cross-cut tunnels have been driven; the first, 300′ long with a 65′ drift on the vein; the second, 80′ below, is 40′ long. A 33′ shaft on the vein will tap the upper tunnel. Two men are at work. J. T. Lockhard, of Ono, Shasta County, owner.

Jerusalem Bar Mine (Hydraulic).—It is 9 miles W. of Ono, at about 3,000′ elevation, and contains 30 acres. The gravel bank is 20′ deep and the pit is 60′ wide; the ground is very rocky and carries coarse gold; 200 inches of water is taken from Jerusalem Creek through half a mile of ditch and delivered, under 60′ pressure, to a small giant through 200′ of 8″ pipe. There are 100′ of flume, 18″ wide, and provided with Hungarian and pole riffles, which are cleaned once a season. Three men are at work. J. Barnes and J. Moon, of Ono, Shasta County, owners.

Jim & Co.'s Mine (Placer).—It is situated in Weaver Basin, west of Weaverville, and is worked by 5 Chinese.

Jim Sing (*Eastman*) *Mine* (Hydraulic).—It is at the mouth of Eastman Gulch, on Trinity River, 6½ miles from Lewiston, at 2,100′ elevation, and contains 114.65 acres, one half of which is worked out. The entire 20′ bank is gravel, and is worked with a giant with 5″ nozzle, and the help of a derrick. The gold is distributed throughout the gravel. Water is obtained from Mooney and Eastman gulches; the ditch from the former is 3 miles long, 14′ wide on top and 8′ on bottom; the second ditch is 6′ wide on top and 4′ on bottom, and gives 100′ pressure. There are 1,500′ of 3″ to 11″ pipe. The flume is 2,000′ long, with 7′ dump into Trinity River. Nineteen Chinese are employed. Jim Sing and partners, of Lewiston, owners.

Joe Hams Mine (Hydraulic).—It is 7 miles S.E. from Junction City, at about 1,750′ elevation, and contains 60 acres on a bench of Trinity River. The bank is 40′ high, with 15′ of gravel carrying heavy bowlders next the bedrock, where the gold is coarse; fine gold is found all through the gravel. Maxwell Creek furnishes the water through 2 miles of ditch, 3½′ wide on top, 2′ on bottom, and 2′ deep, on a grade of 1″ per rod, under 125′ pressure, to the giant using 4″ and 5½″ nozzles. The water season lasts eight months. During the past season three acres have been worked. The flume consists of 12 boxes 3′ wide, using 2″x 8″ scantling for riffles. Clean-ups are made monthly. Three men are employed. W. E. Reed et al., of Junction City, owners.

Johnstone Mine (Quartz).—This is on Grizzly Creek, 18 miles N. of Coleridge, at 4,160′ elevation. It is a new discovery. Several open cuts expose a 20″ vein. A. Johnstone, of Coleridge, owner.

Jumbo Mine (Quartz).—It is on the headwaters of Virgin Creek, 10 miles N.W. of Cœur, and is a new discovery. The vein is 8′ thick, standing vertically between walls of decomposed porphyry. W. R. McDowell et al., of Denny, owners.

Junkans Ranch Mine (Hydraulic).—This is on Weaver Creek, 1½ miles from Weaverville. The gravel is from 25′ to 30′ deep, and the pit about 150′ wide. Four acres have been worked off. Work is carried on with one giant with 4″ nozzle, working under 100′ pressure. Water is brought from Brown's Creek through a short ditch, 4′ wide and 30″ deep, carrying from 300 to 400 inches of water. The tail-flume, 3′ wide, with 4″ grade, has 30 boxes, dumping into Weaver Creek. Thirteen Chinese are employed. Ah Fon & Co., owners.

Kabuski Mine (Hydraulic).—It is situated on an old channel of the East Fork of Stewart's Fork, 2½ miles N. of Minersville, at 2,365′ elevation. The bank is all gravel, and is worked in two pits from 30′ to 50′ high, but the bedrock has not been stripped yet. The outlet is through a rock cut to the East Fork, with 30′ dump. Water is taken from Strope Creek through the Meade ditch, 2½ miles long, to a reservoir with a "self-shooter," from which it is delivered through 300′ of 9″ to 7″ pipe to the giant with 4″ nozzle. The flume consists of 12 boxes 3′ wide, set on a 9″ grade. The water season lasts five months. Two men are at work. J. Kabuski, of Minersville, owner.

Keatch Mine (Hydraulic and Drift).—It is on Trinity River, 15 miles above China Flat, and embraces 160 acres, lying at 940′ altitude. Water is taken from Pony Bar Creek through a 3′ ditch, $\frac{1}{4}$ mile long; 200′ of 7″ pipe and a No. 1 giant, under 80′ pressure, are used. The gravel bank is 30′ high. The water-supply is very limited, and drifting is resorted to during the dry season. John Keatch, of Burnt Ranch, owner.

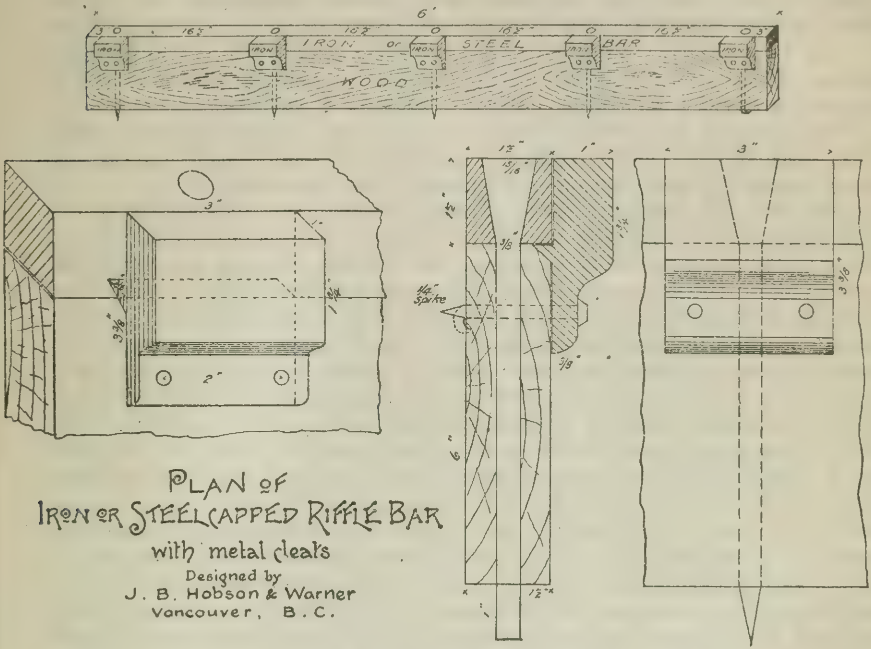
Kelley Mine (Placer).—It lies on Trinity River, 1 mile above Big Bar, at 1,360′ altitude. Water is obtained from Manzanita Creek through a 3′ ditch, 1 mile long. The bank is 60′ high and all gravel. The sluices are 12″ wide, set on an 8″ grade. Mrs. M. Kelley, of Big Bar, owner.

Keystone Mine (Hydraulic).—This is situated on the North Fork of Trinity River, 10 miles N. of Coleridge, and comprises 320 acres, lying at 2,900′ altitude. A large ditch to convey water from White's Creek is under construction; the lumber for the necessary flumes is being made on the ground by a mill with a 60″ saw. It is intended to pipe the gravel the whole width of the valley; sufficient dump for that purpose can be had in the cañon below. Keystone Mining Co., owner; George W. Wilson, of Coleridge, manager.

Kirby Mine (Placer).—It lies at the mouth of Emigrant Creek, 3 miles S.W. of Denny, at 3,550′ altitude. Water for ground-sluicing is obtained from Slide Creek. M. Kirby, of Denny, owner.

Koon Mine (Drift).—It is on the South Fork of Trinity River, 8 miles above China Flat, at 940′ altitude. The mine is located on an old channel of main Trinity River, filled 60′ deep with gravel, and embracing 120 acres. For want of water, drifting is resorted to. John A. Koon, of Burnt Ranch, owner.

La Grange (*Ward, Trinity Gold Mining Co.*) *Mine* (Hydraulic).—See our VIIIth, Xth, and XIIth Reports, pp. 638, 702, and 311. This property is located 4 miles W. of Weaverville, at 2,050′ elevation, and contains over 430 acres. Since our last Report double the amount of ground has been worked, and a new source of water is being brought from Stewart's Fork, where a first right of 6,000 inches will make the working of the mine practically continuous. This ditch, now under construction, will be from 12 to 15 miles in length, and requires 8,394′ of 6′x7′ tunnel. The entire distance will be flumed with a semi-hexagonal flume (the better to hug the hillside), 6′ wide on top, 2′ on bottom, and 4′ deep, with a 10′ grade per mile. A pressure of 900′ will be available, but only about half that amount will be made use of. The proposed tunnel is at an elevation of 3,700′, and will require two years to complete, working machine drills from both ends. The present main ditch is 7′ wide on top, 4$\frac{1}{2}$′ on bottom, and 4′ deep, with a 14′ grade per mile. This receives a small feeder carrying 600 inches of water, and is 3′ wide on top, 2′ on bottom, and 1′ deep, with a 16′ grade per mile. An upper ditch is 7′ wide on top, 4′ on bottom, and 3′ deep, with an 8′ to 9′ grade per mile, and a length of 4$\frac{1}{2}$ miles. There are 8,500′ of 22″, 18″, and 15″ pipe. There are 778′ of 4′ flumes, set on an 8″ grade, paved partly with 13″ blocks, and partly with rocks. There are also two undercurrents, with three partitions, each lined with blocks and rocks. Five giants with 4″ to 7$\frac{1}{2}$″ nozzles, and three derricks with 50′, 81′, and 90′ booms are used. One of these derricks, built on the Loveridge pattern, moves rocks weighing 4 tons, placing them with ease in any desired place, and making 24 trips per hour. The pits are lighted by four arc lights of 2,000 candle-power, furnished by a dynamo of 8½ Kilowatts power, driven by a 3′ Pelton wheel. All parts of the works and ditches are connected by telephone, being 20 miles in extent. Forty men are employed. A French syndicate, owner; W. H. Radford, of Weaverville, superintendent.



PLAN OF
IRON OR STEEL CAPPED RIFFLE BAR
with metal cleats
Designed by
J. B. Hobson & Warner
Vancouver, B. C.

Lang's Bar Mine (Hydraulic).—It is opposite Evan's Bar, 5 miles S. of Junction City, at 1,775′ elevation, and contains 100 acres. This is a high bench, with a bank over 100′ high, carrying 3′ to 4′ of gravel next to the bedrock. Water is taken from Dutch Creek through 3½ miles of ditch, 4′ wide on bottom and 3′ deep; 3 giants with 6″, 4½″ and 2″ nozzles are used, under 200′ pressure. There are 400′ of bedrock cut and two flumes of 5 boxes each; and a third of 12 boxes, all set on a 9″ grade, and using pole riffles. Clean-ups are made every three weeks. Fifteen Chinese are employed. Chinese owners.

Last Chance Mine (Hydraulic).—It is situated on a former bench of Trinity River, 4 miles S. of Junction City, at 1,750′ altitude, and contains 60 acres. Two benches are being worked; the bank is from 10′ to 40′ high, with 3′ of gravel, and heavy bowlders on the bedrock; the rest is soil capping. One half an acre of ground has been worked this season. Water is taken from Soldier Creek and Bell's Gulch, through ¾ mile of ditch, 2′ on bottom and 2′ deep, with 18′ grade per mile. The pressure to the first bench is 125′, with 500′ of 7″ pipe; 300 inches of water is used through a No. 1 giant with 3″ nozzle. There are 100′ of bedrock cut and 6 boxes of 3′ flume set on an 8″ grade; riffles are made of 2″x 6″ scantling. The gold is both coarse and fine. About ½ oz. of platinum was also saved during the season. The clean-ups are made once a month. The dump into Trinity River is 20′ high. Two men are at work. Joe Ham and F. Marsh, of Junction City, owners.

Liebrand & Lorenz Mine (Hydraulic).—See McGillivray.

Little & Co.'s Mine (Placer).—It is on French Creek, a tributary of Trinity River, 8 miles N. of Taylor Flat. It is worked by ground-sluicing. — Little et al., of Big Bar, owners.

Little French Bar Mine (Drift).—This is an old bar, and lies on Trinity River, 2 miles above Taylor Flat, at 1,360′ elevation. It is being drifted 7′ below water-level. A current-wheel furnishes power for a large Chinese pump. Water for the sluices is being taken from the river by wing-dam and a ditch ¾ mile long. Spencer & Co., of Big Bar, owners.

Little Prairie Bar Mine (Placer).—It is on Trinity River, 5 miles below Big Bar, at 1,380′ altitude. A ditch is under construction to furnish water for the claim. J. Ziegler, of Big Bar, owner.

Lone Jack (*Enterprise*) *Mine* (Quartz).—See our VIIIth, Xth, and XIth Reports, pp. 643, 710, and 482. It is on the East Fork of Trinity River, about a 1 mile S. of Coleridge, at 1,950′ elevation, and with the Enterprise on the opposite side of the river, comprises ten claims. The Lone Jack vein, about 2½′ wide, trends N.E. and S.W., with a very flat dip to the west, between slate and a hornblende rock, carrying considerable lime. The Enterprise ledge is about 18″ wide, with a N.E. course. On the Lone Jack are four tunnels; the upper one cross-cuts 160′ to the ledge, which it follows 200′ to the N. and 80′ to the S. The other three are driven on the vein; No. 2 is 315′, No. 3, 307′, and No. 4, 200′ long. The corresponding four tunnels on the Enterprise vein are: No. 1, 400′, and the remaining ones 150′, 240′, and 60′ long. The 5-stamp mill, replacing the former arrastra, is supplied with a rock-crusher, an ore-feeder, and back and front mortar-plates, and 37′ of apron- and sluice-plates, set on a 1½″ grade to the foot. The 750-lb. stamps are run at a speed of 90 drops, with 9½″ discharge and 5″ drop, crushing 1¾ tons per day to the stamp. The power is derived from the East Fork of Trinity River through ¼ mile of ditch, using 200 inches of water, under 31′ pressure, on a 6′ Pelton wheel. Plates are scraped daily; batteries are cleaned once per month, yielding 80% of the amalgam. Eight men are employed. — Day, C. Lobdel, and Mrs. J. R. Balch, of Coleridge, owners.

Loman & Wyld Mine (Hydraulic).—See our XIIth Report, p. 312.

Low Bar Mine (Hydraulic).—See Jacob Bros.

Lower Swedes Bar Mine (Hydraulic).—This is on Trinity River, 4½ miles below Taylor Flat, and contains 20 acres, lying at 1,160′ altitude. Water is obtained from Pelletrean Creek through a 2′ ditch, 2 miles long, and delivered through 150′ of 10″ pipe to a No. 1 giant, under 25′ pressure. The bank is 40′ high and all gravel. George Bach, of Big Bar, owner.

Lyons & Co.'s (*Mount Morensis Railroad*) *Mine* (Hydraulic).—See our Xth Report, p. 704. This mine is on Oregon Gulch, 4 miles W. of Weaverville, at 2,050′ elevation. It adjoins the La Grange Co.'s ground, and contains 356 acres. The water to work it is obtained from Ox Cañon and Limekiln Gulch, through a ditch ¾ mile long, 3′ wide on top, 2′ wide on bottom, and 18″ deep, carrying 300 inches of water during the six months' season. The bank is 30′ high, and the gravel contains many heavy bowlders, requiring blasting. The gold is coarse, and is found mostly on the serpentine bedrock. A bedrock flume and 6 boxes, set on a 6″ grade, and paved with blocks, are used. One giant with 4″ nozzle is used. The dump is into Oregon Gulch. Three men are employed. The property belongs to the La Grange Co.

Mahoney & Wallace Mine (Hydraulic).—See our XIIth Report, p. 312. It is a bar of Cañon Creek, ¾ mile S. of Dedrick, at 1,750′ altitude, and, with adjoining properties, has been bonded to a French syndicate. The 1,500 inches of water is taken from East Fork of Cañon Creek through ½ mile of ditch, and delivered through 600′ of 16″ to 11″ pipe to a No. 1 giant.

Maple Mine (Quartz).—See our XIIth Report, p. 312. This mine is 1½ miles S.E. of Dedrick, at 2,500′ altitude. Idle. D. L. Smith, of Dedrick, owner.

Martin's Bar Mine (Hydraulic).—It lies on Trinity River, 1 mile above Taylor Flat, and embraces 20 acres, lying at 1,360′ altitude. The 2′ ditch takes water from Martin's Creek, 1 mile away. A 7″ hose, 150′ long, with a 2″ nozzle, under 60′ pressure, is used. The sluices are 15″ wide, and set on a grade of 8″ per box. The bank is 26′ high and all gravel. Larsen & Carlsen, of Big Flat, owners.

Martin's Flat Mine (Placer).—It is on Trinity River, 6 miles N. of Burnt Ranch, at 760′ altitude. The claim contains 160 acres, and is worked by ground-sluicing. David B. Gray, of Burnt Ranch, owner.

Mary Blaine Mine (Quartz).—It is situated on the mountain, 1 mile N. of New River City, at 6,310′ altitude. The vein, showing 12″ of quartz, is 26″ wide, between porphyry walls. Developments consist of a 130′ cross-cut tunnel, two drifts on the vein, 40′ and 80′ long, respectively, and a winze 120′ deep on the vein, which dips 75° N. Idle. S. B. Brooks, of Cœur, owner.

Mary Jane Mine (Quartz).—See our XIIth Report, p. 312. It is 2½ miles N. of Dedrick. Ralston & Spencer, of Weaverville, owners.

Maston Mine (Hydraulic).—See South Fork.

McLile Mine (Placer).—It is on Rattlesnake Creek, 16 miles N. of Coleridge, and comprises 20 acres, lying at 3,460′ altitude. Water for ground-sluicing is taken from Rattlesnake Creek. Theodore McLile, of Coleridge, owner.

McGillivray (*Leibrand & Lorenz, Mammoth*) *Mine* (Hydraulic).—See our Xth Report, p. 706. It is on the south bank of Trinity River, 5 miles W. of Junction City, at 1,750′ elevation. It is on two of the river benches at Park's Bar. During the past year 2 acres of ground have been worked, with two giants using 5″ nozzles. The outlet is through a long rock-cut and flume, dumping into the Trinity River. Thirteen men are employed. Leibrand & Lorenz, of Junction City, owners.

McMurray & Hupp Mine (Hydraulic).—See our VIIIth, Xth, and XIIth Reports, pp. 638, 701, and 312. It is on the east side of Weaver Creek, ½ mile below Weaverville, at 2,100′ elevation on the bedrock, and contains 96 acres of gravel, 40′ deep; 2½ acres have been worked the past season, with 9 men. McMurray & Hupp, of Weaverville, owners.

Minersville Mine (Hydraulic and Drift).—See our XIIth Report, p. 312. It is 2 miles N. of Minersville, at 2,375′ elevation, and contains 16 acres along the East Fork of Stewart's Fork, at Hayward's Flat, under which a 250′ drift has been driven. Water is obtained from the Meade and Barman ditches, which give 300′ pressure to a giant using a 4″ nozzle, through two lines of 11″ and 7″ pipe, 600′ long. The gravel bank near the rim is about 30′ high; cemented next to the bedrock. The present workings are on the east side of the creek, where there is a 4′ flume of 4 boxes, set on a 6″ grade, and dumping into the East Fork. Two men are at work. D. Bolton & Son, of Minersville, owners.

Minersville Hydraulic Gold Mining Co.'s (*Diener*) *Mine* (Hydraulic).—It is N. of Minersville, at 2,300′ elevation, and contains over 2,000 acres. It has lately been acquired by a French syndicate, and most of the work of the past season was preliminary to getting a working face; 10 acres were cleared of brush and timber, and piped off, the ground being shallow, with small bodies of gulch gravel in places, carrying coarse ("pumpkin seed") gold. Many of the bowlders give distinct proof of glacial action. The bedrock, where washed, is partly cement, partly shale. The company derives its water from the East Fork of Stewart's Fork, through 4 miles of main ditch, carrying 5,000 miner's inches, and 20 miles of branch ditches. The dimensions of the main canal are 8′ on top, 5′ on bottom, and 3′ deep, with a grade of 26′ per mile; from the main ditch one branch carries 3,000 miner's inches, and the other 2,000 miner's inches. The main canal is to be enlarged to a capacity of 7,000 miner's inches. The company's entire claims are dominated by the ditch system, which is carried well up to the top of the ridges, giving a pressure of 450′. The company have 4,000′ of 22″ to 18″ pipe-line. Two of the largest-size giants, with 8″ nozzles, are employed. The water season is continuous. There are two strings of flumes, of 12 boxes each, 8′ wide, with 8″ grade per box; the dump can be directed either into Digger Creek or through Strope Gulch. Thirty men are employed. A French syndicate, of Minersville, owners; Cte de Kergolay, of Minersville, president and superintendent.

Modoc Mine (Quartz).—It is on Eagle Creek, ½ mile N. of Cœur, at 4,450′ altitude. The vein is in the contact between serpentine and diabase, and is made up of irregular seams of quartz, 2″ to 6″ thick, in a matrix of decomposed serpentine. The dip is about 45° N.E. A 1-stamp mill and 10 H.P. engine are on the property. G. W. Healey, of Cœur, owner.

Mohawk Mine (Quartz).—It is 1 mile N.W. of Carrville, at 2,600′ altitude, and consists of three claims, with two veins; one trending N.W., and the other E. and W., dipping almost perpendicularly. The principal vein is along the contact of serpentine and porphyry, 2′ wide, without any sulphurets. A 15′ shaft has been sunk on the vein; a cross-cut tunnel has been driven 60′, and requires 20′ more to reach the vein. Two men are at work. G. L. Carr, of Carrville, owner.

Moore Mine (Placer).—It lies at the mouth of Rattlesnake Creek, 16 miles N. of Coleridge, at 3,340′ elevation, and contains 40 acres. Water for ground-sluicing is taken from Rattlesnake Creek. William Moore, of Coleridge, owner.

Morrison & Van Sickles Mine (Drift).—It is ½ mile W. of Minersville, at 2,300′ elevation at the tunnel's mouth, and contains 40 acres on an old river channel. The 4′ x 7′ tunnel runs W. in gravel on the bedrock, veering around to the N. for 270′; a few feet of the bottom of the tunnel is in the clay-slaty bedrock, and no breasting has been done yet. The gravel is gray, slightly cemented, and has required no timbering so far. The gold is coarse and black, and is found throughout the gravel. One hundred feet above the tunnel on the flat the gravel still crops out. Two men are at work. Morrison & Van Sickles, of Minersville, owners.

Motolano Mine (Quartz).—This is a prospect, on Rattlesnake Bar, between the East and North forks of Trinity River. The vein, from 1′ to 4′ wide, trends E. and W., and dips vertically between porphyry and hornblende walls. The ground lies very steep, and a short drift has been started. The ore carries copper sulphurets. D. C. Dedrick, of Junction City, and C. W. Smith, of Weaverville, owners.

Mountain View and Mountain Lion Mines (Quartz).—These are prospects, situated about 5 miles N.E. from Lewiston, at about 2,000′ elevation, with veins striking N.E. Mrs. Blakemore et al., of Lewiston, owners.

Nash, Abram & Blythe Mines (Hydraulic and Drift).—See Trinity Gold Placer Syndicate.

New Hope Mine (Placer).—It is near the mouth of the East Fork of Coffee Creek, 15 miles N.W. from Trinity Center, and contains 20 acres. Work is being conducted on the bed of the East Fork of Coffee Creek with water from this creek. The channel is 30′ wide, the gravel 7′ deep and tight, with many big bowlders. A bedrock cut blasted up the creek is used in place of a flume. A derrick with 26′ boom, run by an overshot wheel 10′ in diameter, is used. Only coarse gold is saved. Four men are at work. J. Benson and G. J. Bowman, of Trinity Center, owners.

New Moon Mine (Quartz).—It is on Slide Creek, near Denny, at 4,400′ altitude. The vein is 12″ thick, and lies nearly level between diabase walls. The mine is opened by two tunnels, 50′ and 60′ long, respectively. G. B. W. Yocum & Son, of Denny, owners.

New River District.—New River empties into Trinity River a few miles above Hawkins' Bar. The country through which it runs is extremely rough, rocky, and steep. The mountains are made up of hard metamorphic slates, serpentine, and greenstone. Gold is found in paying quantities in all its tributaries. At the heads of Eagle and Slide creeks a series of quartz veins occur, and a number of locations have been made on them. There are two camps a mile apart: White Rock City, on Eagle Creek, and New River City, or Denny (P. O.), on Slide Creek. The country rock is a greenish-gray, close-grained diabase, joined on the east by a soft serpentine. The quartz veins are rich, but small, rarely measuring more than a foot in width. Their course is invariably N.W. and S.E., and the dip about 45° N.E. Near the surface they lie nearly horizontally. All the mining done in the district has been in this broken part of the veins, the quartz being rich and easy to extract. There are a number of stamp mills, both steam and water power, in the camp. There is another series of fissures, coursing E. and W., but of later origin than the quartz veins, and filled with calcitic matter, stained with iron, but barren of gold.

New York Bar Mine (Hydraulic).—It is on Trinity River, 8 miles below Taylor Flat, at 1,120′ altitude. The bank is 25′ high and all gravel. Water is conveyed from Halsey Creek through a ditch 3 miles long, with 300′ of 8″ pipe to a No. 1 giant, under 200′ pressure. The sluices are 24″ wide and paved with block riffles. J. Moody, of Big Bar, owner.

Nicholson Mine (Placer).—It is on New River, 4 miles below Francis, at 1,550′ altitude, and is a new location. A ditch ½ mile long is being dug to obtain water from a small creek. T. M. Nicholson, of Francis, owner.

Ninety-Four Mine (Placer and Drift).—It is 17 miles N.W. of Trinity Center, at 3,675′ elevation, and comprises 20 acres on a high bench of Coffee Creek. The gravel channel at this point is 300′ wide, carrying heavy, large bowlders, with coarse gold on the bedrock. An 80′ drift is being driven. Water for washing purposes is taken from the North Fork of Coffee Creek through 80 rods of ditch, with a grade of ¼″ per rod. One man is at work. J. F. Becker, of Trinity Center, owner.

Nisbrink Mine (Placer).—It is on Eagle Creek, 5 miles W. of New River City, at 3,200′ altitude, and contains 40 acres. Water for ground-sluicing is taken from Eagle Creek. Nisbrink & Apelt, of Cœur, owners.

Noble Mine (Placer).—It lies on New River, 5 miles below Francis, at 1,420′ altitude. It is worked by ground-sluicing, water being taken from Quinby Creek. Noble Bros., of Francis, owners.

North Fork Mine (Hydraulic).—It is on the North Fork of Coffee Creek and its branches, 13 miles S. from Callahan, Siskiyou County, at 6,000′ elevation, and consists of 200 acres on the North Fork of Coffee Creek, 40 acres on Salmon Creek, and 20 acres on Granite Creek. A divide, 6,525′ high, separates the North Fork from the main Coffee Creek. The North Fork heads in a basin at the head of the gorge of an old glacier, along whose east side the remnant of a lateral moraine is very evident. Along the west side the pay-channel has been covered by a slide. The top gravel furnished the earlier rich diggings, but bedrock was rarely reached; this is the aim of the present company. Gold nuggets weighing as high as 8 lbs. have been taken from the top gravel. The present gravel bank is 20′ deep and carries fine gold, requiring the use of quicksilver. Five hundred inches of water are taken from Granite Creek, through a ditch 765 rods long, 3½′ on top and 2½′ on bottom, with a grade ½″ to the rod, and delivered, under 250′ pressure, through 750′ of 8″ pipe to a No. 2 giant, using 2½″ and 4″ nozzles. The main North Fork furnishes the bank water. A derrick, with 70′ boom and run by a 14′ overshot wheel, handles the bowlders. The water season lasts five months. The 3′x 3′ flume consists of 60 boxes, set on a 2½″ grade, and paved with 8″ wooden blocks. All lumber used has to be whip-sawed, and costs 5 cents a foot. Fifteen men are employed. North Fork Placer Mining Co. (a corporation), owner; E. G. Rognon, No. 12 Walker National Bank Building, Salt Lake, Utah, secretary; H. V. Carter, of Callahan, Siskiyou County, superintendent.

North Star Mine (Quartz).—See our VIIIth and Xth Reports, pp. 642 and 710. It is on the East Fork of Trinity River, about 6 miles N. of North Fork, at 1,950′ elevation. Idle, but preparations are being made to resume. H. Junkans et al., of Weaverville, owners.

Occidental Mine (Quartz).—See Bully Choop.

Ong Dean (*Dockery*) *Mine* (Placer).—It is in Weaverville, and contains 3 acres. The gravel is from 5′ to 6′ deep in a 14′ bank. The 120 inches of water is taken from Garden Gulch, and used through canvas hose with 1″ nozzle. There are 18 flume-boxes lined with iron riffles, set on 3″ grade. Five Chinese are employed. Ong Dean (Chinese), of Weaverville, owner.

Original Bully Choop Mine (Quartz).—See Bully Choop.

Oro Grande Mine (Quartz).—See our XIIth Report, p. 313. It is in Hostetter Gulch, 6½ miles N.E. from Trinity Center, at about 3,500′ elevation. Since our last Report a tunnel, 800′ below the upper works, has been driven to cut the vein. Ten men are employed. Stroude Bros., of Trinity Center, owners.

Ozark Mine (Quartz).—See our XIth Report, p. 482. This is on Rich Gulch, 6 miles from North Fork, and contains two full claims. The vein, 4″ to 8″ wide, trends E. and W., dips about 25° N., between greenstone walls, and carries high-grade sulphurets and tellurides. The mine has been opened by two tunnels and a shaft, and has a water-power arrastra. Idle. J. W. Moore, of Coleridge, owner.

Patterson Mine (Hydraulic).—See Jacob Bros.

Paulsen & Hughes Mine (Hydraulic).—See our XIIth Report, p. 313. It is about 3 miles E. of Douglas City, and includes the *Bald Point*, *Blue Gulch*, *Gold Dollar*, *Hughes*, *Union Nos. 1 and 2*, and *Vitzthum Gulch* claims, comprising 575 acres, located in Secs. 32, 33, and 34, T. 32 N., R. 11 W., at from 2,000′ to 2,600′ elevation. The entire area shows wash gravel of 30′ calculated average depth. The gravel is in part underlaid with cement; the bedrock is serpentine and slate, and there is a good dump into the Trinity River. On the Bald Point claim the rim rock crops out at 2,050′ elevation, where a tunnel has been driven, showing the course of the channel to be E. and W. At the supposed center of the channel the surface indicates a depth of 200′ of gravel. At the southwest end of the Blue Gulch claim, where the gravel has broken out, a 34′ cut and tunnel have been made. Other cuts have been opened on Ritter Gulch, in the S.E. corner, at 2,600′ elevation. The water is derived from Grass Valley Creek; 8 miles of the ditch have been completed, and 3 miles more are yet to be dug to bring the water on the ground. This ditch is 4′ on bottom and 2′ deep, with a grade of 16′ per mile. Its capacity is 1,500 inches, which can be delivered over the highest point of gravel with 400′ to 500′ pressure. Two men are prospecting the ground. Paulsen & Hughes, of Weaverville, owners.

Phillips Hill Mine (Hydraulic).—This property is ¼ mile from Lewiston, on a high bench of Trinity River, at about 2,300′ elevation, and contains 60 acres. The gravel bank averages 20′ high. About one half the ground has been worked off. Water is obtained from Deadwood Creek through two ditches, 3 and 5 miles long, respectively. The first is 5′ wide on top and 3′ on bottom with ¾″ grade per rod; the second is 8′ on top and 5′ on bottom, with ½″ grade per rod, giving 250′ pressure through 300′ of 13″ to 11″ pipe to a No. 3 giant with a 5″ nozzle. A 900′ bedrock tunnel gives a 100′ dump into Trinity River; the flume is 4′ wide and paved with rock. The gold is both coarse and fine. During the short season of six weeks, 6 men are employed. Phillips & Co., of Lewiston, owners.

Pickett Mine (Hydraulic).—See Compagnie Française des Placers Hydrauliques de Junction City.

Pony Point Mine (Drift).—It is situated on Trinity River, 1 mile below Taylor Flat, at 1,160′ altitude. The point is a gravel bar containing many large bowlders. The bedrock lies 10′ below the water-level, and a Chinese pump, driven by a current-wheel, is used to keep the mine dry. Some sluicing is being done on the surface during high water in the river; water for that purpose is brought from Swedes Creek through 3 miles of ditch 2′ wide. John Cooper, of Big Bar, owner.

Poor Man's Friend Mine (Quartz).—It is 12 miles W. of Hay Fork, at 3,100′ elevation, and is a recent discovery on a mammoth ledge, 40′ wide, running N.E., and dipping S. between slate and porphyry walls. Six claims are comprised in the property. The quartz is fine-grained and carries a heavy percentage of copper and iron sulphurets. The ledge is exposed for quite a distance through a slip of one of the walls. The quartz is said to assay 148 ozs. silver and from $4 to $6 in gold. Five men are at work. W. H. Friend et al., of Hay Fork, owners.

Price Mine (Hydraulic).—It lies at Cox Bar, on Trinity River, ½ mile above Big Bar (P.O.). It contains 20 acres, and lies at 1,360′ altitude. The channel runs parallel to the river and about 50′ above it. Water is brought from Sawmill Creek through a mile of 3½′ ditch; 300′ of 15″ pipe, and a No. 3 giant, under 80′ pressure, are used. The large bowlders are reduced by blasting, and sluiced off. The sluices are 3′ wide, set on a grade of 8″ per box, and paved with block riffles. T. B. Price, of Big Bar, owner.

Quinby Mine (Placer).—It is on Trinity River, 9 miles above China Bar, at 710′ elevation, and contains 40 acres. Water for ground-sluicing is taken from Quinby Creek, through a ditch 1 mile long and 2′ wide. Mrs. Jeanette Ziegler, of Burnt Ranch, owner.

Rainbow Mining Co.'s Mine (Placer).—It is situated on a bar of Coffee Creek, 12 miles N.W. of Trinity Center, at 3,200′ elevation, and contains 160 acres. A pit 10′x 12′x 30′ is being sunk on a bar, and about 7′ more will be required to reach bedrock. Gravel and bowlders are hoisted up an incline by windlass. The gravel in the upper strata is loose, but near the bedrock it is tight, and carries heavy bowlders. A 6″ pump, with 3′ stroke, run by a 12′ overshot wheel, taking water from a neighboring gulch, keeps the pit drained. Wash-water is taken from Coffee Creek, using 9 sluice-boxes, set on a 1½″ grade, and furnished with slat and auger-hole riffles. All the wood-work is from split lumber, hand-dressed. Ten men are employed. G. W. Burner et al., of Trinity Center, owners.

Rattlesnake Mine (Quartz).—It is at the head of Rattlesnake Gulch, between the East and North forks, about 30 miles N. of North Fork (P. O.), and contains five full claims. There are two veins, varying from 6″ to 3′, which course E. and W., and dip 65° N. The ore carries a large percentage of copper pyrites. On No. 1 claim are two tunnels, about 60′ apart, from 60′ to 70′ in length, and connected by an upraise. Some stoping has been done. The mine requires solid timbering. A self-discharging, continuous-working arrastra, 9′ in diameter, driven by a horizontal water-wheel, and supplied with No. 50 screen, reduces 5 tons in twenty-four hours. The water-power can be furnished by either fork of the creek, the left-hand fork furnishing 5,000 inches and the other a larger amount, through a ditch 1,500′ long, 6′ on top, 4′ on bottom, with 1½″ grade per rod, and delivered under 100′ pressure. Three men are at work. D. C. Dedrick, of Junction City, and S. Smith, of Weaverville, owners.

Ray Mine (Quartz).—It is on Donnelly Gulch, 1¼ miles W. of Deadwood, at 2,400′ elevation. It consists of two claims, one on either side of the gulch. The vein, 10′ wide, strikes E. and W., dips about 60° N., between slate and porphyritic walls. The quartz is heavily mineralized. On the east side of the gulch two tunnels have been driven, 275′ and 60′ respectively, and one on the west side, all in the vein. Four men are employed. J. Ray, of Deadwood, owner.

Red Flat Placer Mine (Drift).—See Dannenbrink.

Red Hill Mine (Hydraulic).—See our Xth Report, p. 706. Now known as McGillivray or Leibrand & Lorenz Mine.

Red Hill Mine (Hydraulic).—It is 1½ miles W. from Lewiston, and consists of 20 acres on a high bench of Trinity River. The bank is 40′ high, all gravel, and is worked from one pit, using two No. 2 giants with 4″ and 5″ nozzles. Rush Creek furnishes 600 inches of water through 7 miles of ditch, 2′ on bottom and 2′ deep, with ¾″ grade per rod, delivered, at present, under 50′ pressure, through 1,000′ of 18″ to 11″ pipe. The gold is fine, requiring quicksilver in the 200′ of bedrock cut and flume, which is 480′ long and 3′ wide, set on an 8″ grade, and paved with rock riffles. The dump is into Trinity River. One quarter of an acre of ground has been worked the past season. Six inches of the slate bedrock is picked up. Four men are employed. V. M. Chamberlain, of Lewiston, owner.

Red Hill Mine (Hydraulic).—It is situated opposite Minersville, on the East Fork of Stewart's Fork, at 2,300′ elevation, and consists of 60 acres on a high bench of the river. The 40′ bank has 15′ of soil and clay capping, which carries a little gold. The channel, of gray gravel, is 125′ wide. A 45′ drift has been run on the bedrock, which gave good "prospects" by panning. The entire ground is heavily timbered. Water can be taken from the Barmen ditch, under 100′ pressure, and there is a 100′ dump into the East Fork of Stewart's Fork. Three men are opening the claim. J. L. McLees et al., of Minersville, owners.

Reindeer Mine (Quartz).—It is on Coffee Creek, 5 miles N.W. of Carrville, at 3,000′ elevation. It includes two claims, with a vein trending N.E., and dipping 75° N.W., in porphyritic rock. The quartz is glassy, and carries but few sulphurets. There are two open cuts, 10′x 10′ and 5′x 12′, and a 10′ shaft on the vein. Two men are prospecting. A. Hill, of Carrville, owner.

Ridgeway Mine (Quartz).—It lies ½ mile N. of New River City, at 4,750′ altitude. An incline shaft, 200′ deep, was sunk on the vein; later a cross-cut tunnel, about 1,000′ long, was driven. The vein was not cut by it, and the work was discontinued. A 10-stamp steam-power mill, with 850-lb. stamps, belongs to the property, and is connected by tramway with the mouth of the tunnel. The vein is 10″ thick, and both walls are diabase. Ridgeway Gold Mining Co., of Denny, owner.

Rocky Point Mine (Quartz).—It is on Eagle Creek, 3 miles N.W. of Cœur. The vein shows 6″ of quartz, and stands vertically. There is a tunnel 60′ long and an incline 30′ deep on the property. Idle. Charles Ellis, of Cœur, owner.

Salt Lake Mine (Quartz).—See Smith.

Sam Lee (*Harvey*) *Mine* (Hydraulic).—It is 1 mile E. of Weaverville, on the Lewiston road, and contains 30 acres, one half of which has been worked off. The gravel bank varies from 3′ to 20′ in height, and is worked with three giants with 4″ nozzles, under 125′ pressure, two being used for piping and one for washing. The water is obtained from the Sloane and Howe ditches, from Little Weaver Creek. The gravel is washed through a rock-cut and 20 boxes of flume, 3′ wide, and set on a 4″ grade. Thirteen Chinese are employed. H. Junkans, of Weaverville, owner.

Sandy Bar Mine (Hydraulic).—It lies on Trinity River, 6 miles below Taylor Flat, at 1,140′ elevation. The bank shows 30′ of gravel; the bedrock is 50′ above the river. A ditch, 2′ wide and 1½ miles long, is being dug to bring water from Vance's Creek. Thomas Wyatt, of Big Bar, owner.

Scott Mine (Placer).—It is on New River, 6 miles below Francis, at 1,500′ elevation, and contains 20 acres. Water is brought from Quinby Creek through a ditch 2′ wide and ½ mile long; 60′ of 7″ hose and a 2″ nozzle, under 25″ pressure, are in use. The sluices are 18″ wide and paved with block riffles. Scott & Stout, of Francis, owners.

Self-shooter Mine (Placer).—It is on Pony Creek, 10 miles above Francis, at 2,290′ altitude. The claim is worked by ground-sluicing; a "self-shooter" (discharging) reservoir being made use of. Barnes & Co., of Francis, owners.

Sharpar Mine (Placer).—It is on Trinity River, 8½ miles above China Bar, at 725′ elevation. It contains 80 acres, and is worked by ground-sluicing. John Sharpar, of Burnt Ranch, owner.

Sheridan Mine (Hydraulic).—See our XIIth Report, p. 313. It is on Trinity River, 2 miles S. of Junction City. Since our last Report ½ acre has been worked off on the rim, the outlet being through a bedrock tunnel 500′ long, and continued 300′ for bedrock flume, 3′x 3′, on a 4″ grade. Four men were employed for the three months' season. Sheridan Bros., of Junction City, owners.

Sherman Mine (Placer).—It is on Grizzly Creek, 17 miles N. of Coleridge, at 4,000′ elevation. Worked by ground-sluicing. Robert Sherman, of Coleridge, owner.

Sherwood Mine (Quartz).—It is on Eagle Creek, 1 mile N. of Cœur, at 4,450′ elevation. It has been stoped to a depth of about 200′, and allowed to cave. Lately a 240′ cross-cut tunnel has been run, and a winze sunk 80′ on the pitch of the vein; in the bottom of it the vein shows 4′ of mineralized matter, with a streak of quartz 8″ thick on the foot-wall and one of 4″ on the hanging-wall. The ore carries a large amount of pyrites, which are not caved. O. P. Sherwood, of Cœur, owner.

Shoo-Fly Mine (Hydraulic).—See Haskins.

Silver Gray Mine (Quartz).—See our XIIth Report, p. 313. It is 2½ miles E. of Dedrick. Only 103 tons stoped and 10′ of tunnel driven since our last Report. J. M. Thompkins, J. Schock, et al., of Weaverville, owners.

Smith Mine (Quartz).—It is in Sec. 19, T. 36 N., R. 9 W., about 23 miles N. of Weaverville, at 4,000′ altitude, and consists of ten claims. There are several veins. The principal one is the *Deer Creek* lode, coursing N. and S., with an outcrop about 150′ wide; 600′ farther east a second parallel vein is 7′ wide. The other claims are known as *Salt Creek Nos. 1, 2, and 3*, with veins from 2′ to 4′ wide, striking N.W. The *Gray Mare* lode is 30′ wide, and has a N.W. course; the *Bonanza*, *Stewart's Fork*, and *Dark Horse* lodes have a N.E. trend. No developments of consequence have been made along these veins, which are in a well-timbered and well-watered country. The country rocks are slate, limestone, and porphyry; some of the veins carry a considerable percentage of sulphurets. Salt Creek can furnish 100 miner's inches of water, and Deer Creek 400 inches with ¾ mile of ditch. J. Smith, of Weaverville, owner.

Smith Mine (Quartz).—It is on Rattlesnake Creek, 26 miles N. of North Fork (P. O.), and embraces two locations on a recently discovered quartz lode. The vein varies from 4″ to 2′. The developments consist of a 50′ tunnel on the vein, and several open cuts. An arrastra, to be driven by an overshot water-wheel, is nearly completed. Smith Bros., of Junction City, owners.

Snyder's Bar Mine (Drift).—It lies on Trinity River, 4½ miles below Taylor Flat, at 1,150′ altitude. Worked by drifting in the bank of the river above water-level. Rhodes & Palmer, of Big Bar, owners.

Souden Mine (Hydraulic).—It is 1½ miles W. of Weaverville, and contains 8 acres of gravel, worked with one giant by a Chinese company, with water from West Weaver Creek.

South Fork (*Maston*) *Mine* (Hydraulic).—See our XIIth Report, p. 133. It is between the forks of Trinity River, 6 miles above China Flat, at 660′ elevation, and comprises 1,800 acres. The long and expensive ditch not being completed, drifting is resorted to. The channel is 800′ wide on slate bedrock, and the gravel is 20′ to 30′ deep, and somewhat cemented. South Fork Mining Co., owner; Peter Hammer, of China Flat, Humboldt County, manager.

Stetson Mine (Hydraulic).—It is on Trinity River, 8 miles below Taylor Flat, at 1,140′ elevation. A No. 2 giant, under 200′ pressure, and 400′ of 9″ pipe, are in use. Water is brought from Halsey Creek by a 2′ ditch 1½ miles long, and the bank is 30′ high. Stetson & Co., of Big Bar, owners.

Stevens Mine (Placer).—It is on the North Fork of New River, 4 miles above Francis, at 1,960′ elevation. Water for ground-sluicing is taken from a small gulch through a 2′ ditch ½ mile long. F. P. Stevens, of Cœur, owner.

Stewart's Fork Mine (Quartz).—See Smith.

Sulphur Spring Mine (Hydraulic).—It is 1½ miles W. of Lewiston, and adjoins the Red Hill Mine. It is leased to and worked by Chinese, who use one giant, with water at night, from the claim above, paying $150 per season. The gravel next the bedrock is strongly cemented; the bedrock has not been reached yet. Eleven boxes 40″ wide, set on 3¼″ grade, are used. Five Chinese are working. V. M. Chamberlain, of Lewiston, owner.

Swift & Co.'s Mine (Hydraulic).—See our XIIth Report, p. 313. This is 4 miles N.E. of Douglas City, and contains 80 acres. Since our last Report ¾ acre of ground has been worked by 3 men. — Swift et al., of Douglas City, owners.

Taylor Flat Mine (Hydraulic).—It is on Trinity River, 10 miles below Big Bar, at 1,290′ elevation, and contains 147 acres. The mine is an accumulation of gravel 35′ high, in a bend of the river, lying 10′ to 15′ above low-water mark. A ditch 6′ wide and 4½ miles long, with a grade of 10′ per mile, conveys water from French Creek to the mine. There are 3,000′ of 15″ pipe and two No. 5 giants, under 300′ pressure. The sluices are 4′ wide, with block riffles, and set on a 3″ grade. The slight grade in the sluices necessitates the removal of stones by a derrick, and is causing a heavy and unnecessary expense, as a good dump and ample grade may be had. Idle. Griffith, Perkins & Co., of Big Bar, owners.

Thomas Mine (Placer).—It is on New River, 6 miles below Francis, at 1,510′ elevation, and contains 80 acres. Worked by ground-sluicing, with water brought from Quinby Creek through a 3′ ditch 1½ miles long. The bank is 16′ high and all gravel. R. L. Thomas, of Francis, owner.

Tinsley Mine (Drift).—It lies on Trinity River, 1 mile above Big Bar, at 1,350′ elevation. It is worked by drifting in the bank of the river. C. W. Tinsley, of Big Bar, owner.

Toronto Mine (Quartz).—It is 1½ miles N.W. from Deadwood, at 1,800′ elevation. There are several veins on the property trending E. and W., and dipping N. and S., between slate and porphyry. The largest of these is 3′ wide. Several tunnels have been run, the longest giving 300′ of backs. Two of the tunnels are cross-cuts, 70′ and 80′ long, and two others are short drifts on the vein. Some of these veins carry a heavy percentage of iron and arsenical sulphurets. One man is at work. C. Murphy, of Deadwood, owner.

Toughnut Mine (Quartz).—It is on New River, near Denny, at 4,450′ altitude. The developments consist of four tunnels, 100′ to 200′ long, run on the cropping of the vein, about 100′ apart. The vein averages 8″ in width, courses N.W. and S.E., and dips 45° E. Both walls are diabase. T. J. Ladd et al., of Denny, owners.

Trinity River from North Fork (village) to the mouth of the South Fork, on the line of Humboldt County, runs through a cañon. The hills on both sides are steep and rocky, and recede only here and there far enough from the river to allow gravel bars to form. Parts of former channels, always rich in gold, are found on the hillsides many hundred feet above the present river. Water for piping can generally be had at small expense. From Cedar Flat to the mouth of New River the Trinity runs through a box cañon 2,000′ deep, and inaccessible to the miner. Below New River the valley widens, and vast accumulations of rich gravel are found. Several old channels, one above the other, may be traced along the hillsides. To work these deposits water must be brought a distance of 15 to 20 miles, and the great expense has so far prevented the gravel from being worked.

Trinity Gold Placer Syndicate's (*Ltd.*) (*Nash, Abram & Blythe*) *Mine* (Hydraulic and Drift).—See our Xth Report, pp. 697 and 698. This property is at the headwaters of Coffee Creek, and extends for a continuous distance of 7 miles along the creek. The main works are 23 miles N.W. of Trinity Center, and can be reached by trail only; they are chiefly on the old Nash & Abram ground; the whole embraces an area of 4,000 acres, at about 5,000′ elevation. The ground to be worked is partly covered with glacial debris, but embraces also the present creek-bed and high benches of the same. The conformation of the ground at the head of the creek indicates that the present drainage of Salmon River formerly took its course through Coffee Creek, as a narrow barrier at present cuts off and deflects Salmon River. The grade from the Big Gravel Flat, one of the sources of Coffee Creek, down to the present workings on the Nash property, a distance of 6 miles, gives a fall of about 650′, or a 2% grade; beyond this the grade is much lighter. The gold in the upper reaches of Coffee Creek, as far down as the former Abram property, is similar in character and value ($17 50) to the Salmon River gold. Below, on the Nash property, the gold has a higher value. To decide the existence of a supposed back channel the company drifted 200′ in the southeast bank, without obtaining any results. A cut 5,000′ long is being brought up the creek at Abram's Flat to drain the same, in an attempt to reach bedrock; the present face of the cut is 12′ in gravel. A portion of this section of the property is leased, and is being drifted with favorable results. During the past season some drifting was done on the Nash portion of the property. Below the main work on the Nash ground considerable grade is gained by tunneling a spur of the ridge that has diverted the straight course of the channel. About 1½ miles from the main works the company has a sawmill, with a capacity of 15 M. per day. The formation is partly granitic and partly serpentinoid, showing former continuous glacial action. The South Fork of Coffee Creek affords 3,000 inches of water. through a ditch 4′ on top and 2½′ on bottom, with ¼″ grade per rod, Sixteen men are employed. An English syndicate, owner; W. Maitland, of Abrams, manager.

Trinity River Hydraulic Mining Co.'s Mine (Hydraulic).—See our XIIth Report, p. 314. It is situated 3½ miles N.W. from Douglas City, and contains 360 acres on a high bench of Trinity River. Since our last Report the former pits have been partially abandoned and a new cut has been started from old Turner Bar, requiring 40 rods of new ditch. Six men are employed. A. S. Dunbar, of Douglas City, superintendent.

Uncle Sam Mine (Quartz).—It lies on Eagle Creek, ½ mile N. of Cœur, at 4,500′ elevation. There are three short tunnels and a 200′ shaft on the claim. The vein is 8″ thick and stands vertically, between diabase walls. A 5-stamp steam-power mill, with 300-lb. stamps, belongs to the property. James Cullich, of Cœur, owner.

Underground Treasure Mine (Placer).—It is on the East Fork of Coffee Creek, about 3 miles above its mouth, at 4,750′ elevation, and 21 miles from Trinity Center. The property contains eight claims, or 160 acres, on the channel of the East Fork. The bank is about 40′ high and the channel about 30′ wide, half the width being worked at a time with a self-shooting reservoir, which empties in about five minutes through a 14″x 16″ culvert. It takes forty minutes to fill the reservoir during the best part of the water season; later it requires two hours to fill. The water used is from the East Fork of Coffee Creek. The large bowlders are handled with a derrick. Instead of a flume, a big bedrock cut is used, saving the coarse gold only. The gravel is loose and of a gray color. Three men are employed. P. Holland, of Trinity Center, owner.

Union Hill Mine (Hydraulic).—It is in Sec. 6, T. 32 N., R. 9 W., 1 mile E. of Douglas City, between Weaver Creek and Trinity River, and contains 300 acres. The works have been shut down through a slide filling all their tunnel and cuts, and the ground cannot be reopened without driving a new tunnel from the Trinity River side. The former tunnel, carrying the flume, was 800′ long, and on a 4″ grade. From 10 to 15 acres have slid out and filled the cuts. The former pits had banks 94′ high, with 2′ to 14′ of gravel, and the remainder loose soil-capping, which, when saturated with water, flows like mud; this capping carries gold throughout. Water is brought from Weaver Creek through 9 miles of ditch, with a very light grade. By continuing the Grass Valley ditch, water under a good head can be procured. A good dump into the Trinity River may be obtained by driving a short tunnel. The ground contains very few bowlders. Mason & Fair, of Douglas City, owners.

Upper Swedes Bar Mine (Drift).—It is on Trinity River, 1 mile below Taylor Flat, at 1,150′ elevation. Worked by drifting in the bank of the river, above the water-level. Charles Kinterman, of Big Bar, owner.

Vance's Bar Mine (Drift).—It is on Trinity River, at Big Bar (P. O.), at 1,320′ elevation. The claim is worked by drifting in the bank of the river. Water is obtained from Deer Creek, and piped across the river on a suspension bridge 300′ long. Harrington & Wallace, of Big Bar, owners.

Van Winkle Mine (Drift).—It lies on Trinity River, 5 miles below Big Bar, at 1,380′ elevation. The drifts are under the bank, 9′ below water-level. Water to drive an overshot pump-wheel and to fill the sluices is taken from Little French Creek. Elias Van Winkle, of Big Bar, owner.

Vitzthum Gulch Mine (Hydraulic).—See Paulsen & Hughes.

Ward Mine (Hydraulic).—See La Grange.

Waters Mine (Placer).—It is on the North Fork of Trinity River, 7 miles N. of Coleridge, at 2,520′ elevation. Worked by ground-sluicing. William Waters, of Coleridge, owner.

Watson's Bar Mine (Hydraulic).—It is on Trinity River, 2 miles below Taylor Flat, at 1,180′ altitude, and contains 28 acres. Water is taken from Swedes Creek and conveyed across the river through a 7″ canvas hose, 300′ long, suspended on a wire rope, which is inside the hose. A 2′ nozzle works under a 100′ pressure. The bank is 30′ high and all gravel, and the sluices are 24″ wide. Pelletrean & Co., of Big Bar, owners.

Webber Mine (Placer).—It lies on the East Fork of New River, 8 miles above Francis, at 2,120′ elevation. Worked by ground-sluicing. Webber & Niles, of Francis, owners.

White's Bar Mine (Drift).—It is on Trinity River, 1½ miles below Big Bar (P. O.), at 1,310′ elevation, and contains 20 acres. The claim lies on a bar near the river, which is being drifted 15′ below the river water-level. The mine is cleared of water by a large Chinese pump, driven by an overshot water-wheel 15′ in diameter and 3′ wide. Water for power and sluices is taken from the river by a wing-dam and ditch. J. W. Philbrooke, of Big Bar, owner.

Wilshire Mine (Hydraulic).—It is on Trinity River, at Big Bar, at 1,355′ elevation. Water is taken from Sawmill Creek through a 3′x 2′ ditch 2 miles long, and delivered through 1,000′ of 15″ pipe to a No. 3 giant, under 60′ pressure. The sluices are 24″ wide, and set on an 8″ grade. A vein of coal crops out on this claim. Stewart Gibson, of Weaverville, owner.

Yellowstone Mine (Quartz).—See our Xth and XIIth Reports, pp. 711 and 314. It is at Coleridge, on the East Fork of Trinity River, and constitutes part of the property of the Niagara Company, in Shasta County. It is being worked on a lease by 2 men, who are driving ahead on the vein. Niagara Mining Co., of French Gulch, Shasta County, owner.

MILLS IN TRINITY COUNTY.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of Each, in Lbs.	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
					No.	Character.	No.	Capacity.		
Bartred	Steam	10	850	15						
Bonanza King	S. & W.	5	800							
Boomer	Water	3	450							
Brizard	Water	2	400							
Brown Bear	Steam	15	750	25	4	Frue				
Excelsior	Water	6	450							
Fountain Head and Thanksgiving	Steam	5	650	6¼	4	Frue				
Golden Chest	Water	5	750	6¼	4	Frue & Triumph				
Lone Jack and Enterprise	Water	5	750	8½						
Modoc	Steam	1	650							
North Star	Water	10	900	15	1	Frue				
Occidental and Bully Choop*	Steam	3	850	6	1	Triumph				
Oro Grande	Water	5	750	7½						
Ridgeway	Steam	10	750							
Uncle Sam	Steam	5	300							
Yellowstone	Water	10	850	7½						

In addition to stamps, the mills marked with a * have additional crushing capacity, as noted in the following list :

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN TRINITY COUNTY.

Name of Mill or Mine.	Power.	Number	Character.	Diameter	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
						No.	Character.	No.	Capacity.		
Alaska	Water	1	Arrastra	13′	4						
Amy Balch	Water	1	Arrastra	9′	2						
Buck's Ranch	Water	2	Huntington	3½′ & 5′							
Chloride	Water	1	Huntington	3½′	6						
Excelsior	Horse	1	Circ'lar Roller		1						
Forget-Me-Not	Water	1	Arrastra	9′	2						
Frick & Davis	Water	1	Arrastra		1						
Globe	Steam	1	Huntington	3½′	5						
Himes	Water	1	Arrastra	10′	2						
Maple	Water	1	Arrastra	10′	4						
Occidental and Bully Choop	Steam	1	Arrastra	8½′							
Ozark	Water	1	Arrastra		4						
Rattlesnake	Water	1	Arrastra	9′	5						
Silver Gray	Water	1	Huntington	5′	10						
Smith	Water	1	Arrastra								
Vermont	Steam	1	Cannon Ball		3						

Tulare County.

Adams Flat Mine (Placer).—See our XIIth Report, p. 295. It is 5 miles S. of Auckland. A. B. Brown and B. Willis, of Auckland, owners.

Agnes Fletcher Mine (Quartz).—It is in Yokohl Valley, 1 mile E. of Yokohl. An open cut 6′ deep discloses a quartz vein 30″ wide, dipping 45° E. A prospect shaft is being sunk. C. T. Lindsey, of Visalia, owner.

Ante-Up Mine (Quartz).—See our XIIth Report, p. 295. Idle. Charles Newby, of White River, owner.

Bald Mountain Mine (Quartz).—See our XIIth Report, p. 295. It is 1½ miles S.E. of White River, at 2,200′ altitude. The 4′ to 7′ wide vein occurs in granite, and has 4″ to 12″ of pay-ore. The vein courses N. and S., and dips nearly vertically. The older extensive workings are caved. A new shaft, 75′ deep, has been sunk, and drifts run 135′ W. and 50′ E. A small steam hoist is used. An old (built in 1866) 5-stamp steam-power mill belongs to the property. Nelson Hallock, of White River, owner.

Barton Mine (Quartz).—See our XIIth Report, p. 295. It is on Rattlesnake Creek, 2½ miles N. of Auckland, at 1,600′ elevation. The vein is 3′ thick and consists of a mineralized zone, with free gold in a decomposed granite rock. Some 20′ below the vein lies a bed of hard, bluish conglomerate, 250′ to 300′ thick. The pebbles are mostly silicious, water-worn, and flattish, and are cemented together with silicious material. A winze, 100′ deep, has been sunk from the 350′ tunnel, and from which they are stoping. A 3½′ Huntington mill, driven by a 16 H.P. engine, belongs to the property. H. D. Barton, of Auckland, owner.

Billy Brown Mine (Quartz).—It is in Frazer Valley, 8 miles N.E. of Porterville. The development consists of an incline shaft, 100′ deep, and four tunnels, 20′, 26′, 90′, and 110′ long, all on the vein, which is 8″ thick, lies in granite, and dips 70° E. The ore is free-milling, and is worked in a horse-power arrastra. Hocket Bros., of Porterville, owners.

Black Prince Mine (Quartz).—See under head of Silver.

Bluebird Mine (Quartz).—See under head of Silver.

Blue Mountain Mine (Quartz).—See our XIIth Report, p. 296. It is on the western slope of Blue Mountain, in White River District. J. McDonald, of White River, owner.

Bob Allen (*General Grant*) *Mine* (Quartz).—It is on Slate Mountain, 5 miles S.W. of White River, at 1,420′ elevation. The 18″ vein lies in slate, and dips 60° N. There are two shafts, 24′ and 31′ deep, and a tunnel 80′ long on the vein. P. C. Montgomery, of Porterville, owner.

Clara Gibbons Mine (Quartz).—See our XIIth Report, p. 296. It is in Chileno Gulch, 3 miles S.E. of White River, at 1,610′ altitude. The developments consist of a 90′ incline shaft on the vein and a cross-cut tunnel 125′ long, with a drift near the end 100′ long, connecting with the bottom of the shaft. The 6″ vein courses in granite, and dips 45° S.E. C. H. Gibbons et al., of White River, owners.

Coarse Gold Mine (Quartz).—It is ½ mile S. of White River, at 1,240′ altitude. There is a shaft 55′ deep, with drifts 40′ and 50′ long, on the claim. The vein is 4″ wide, and dips 85° S., between granite foot-wall and diabase hanging-wall. J. O. Culver, of White River, owner.

Diamond Mine (Quartz).—It is ¼ mile S. of White River, at 1,250′ elevation. The vein is 3′ wide, with 10″ of quartz, and stands vertically between granite walls. Developments consist of a shaft 42′ deep and 35′ of drifts. Nelson Hallock, of White River, owner.

Domingo Mine (Quartz).—See under head of Silver.

Eclipse No. 2 Mine (Quartz).—See our XIIth Report, p. 296. It is 2½ miles S.W. of White River, at 1,200′ altitude. The vein is 2′ wide, with 6″ to 12″ of quartz, and dips 85° N. The older workings are stoped out and abandoned. The new tunnel is 304′ long and has a 218′ winze near the end, with short drifts near the bottom. Nelson Hallock, of White River, owner.

Ely Mine (Quartz).—See Oliver Twist.

Enterprise Mine (Quartz).—It is on Slate Mountain, 5 miles S.W. of White River, at 1,380′ altitude. There is a 100′ tunnel and a 50′ shaft on a 6″ vein of quartz, dipping 80° N.W. The walls are micaceous schist. J. A. G. Smith, of White River, owner.

Eschscholtzia Mine (Quartz).—See our XIIth Report, p. 296. It is on Bear Mountain, 5 miles E. of Auckland, at 2,600′ elevation. The vein is 10″ wide, and dips 45° W., between granite walls. Two tunnels, 60′ and 70′ long, cut the vein. O. Barton, of Auckland, owner.

General Grant Mine (Quartz).—See Bob Allen.

Good-Enough Mine (Quartz).—See our XIIth Report, p. 296. It is in Chileno Gulch, 3 miles N.E. of White River, at 1,360′ elevation. A new 50′ shaft has been sunk. The vein is 6″ thick, and stands vertically between granite walls. Owen Peters, of White River, owner.

Gray Eagle Mine.—See under head of Silver.

Hardtack Mine (Quartz).—See our XIIth Report, p. 296. Norman Brown, of White River, owner.

Hard Times Mine (Quartz).—See our XIIth Report, p. 296. It is in Chileno Gulch, 3 miles N.E. of White River, at 1,310′ altitude. Idle. J. Jacombs, of White River, owner.

Harvest Home Mine (Quartz).—See our XIIth Report, p. 296. C. Wilbern, of White River, owner.

Homestake Mine (Quartz).—See our XIIth Report, p. 297. It is 2 miles S.W. of White River, at 1,200′ elevation. Idle. D. W. Grover, of Santa Cruz, Santa Cruz County, owner.

Isian Peak Mine (Quartz).—See our XIIth Report, p. 297. G. Dover, of White River, owner.

Keys Mine (Quartz).—See our XIIth Report, p. 297. It lies ¼ mile S.E. of White River, at 1,200′ altitude. Idle. H. A. Harris et al., of White River, owners.

Last Chance (Redfield) Mine (Quartz).—See our XIIth Report, p. 297. It is 2 miles W. of White River, at 1,100′ altitude. Idle. Nelson Hallock, of White River, owner.

Lucky Cuss Mine (Quartz).—See our XIIth Report, p. 297. B. Allen, of White River, owner.

Mammoth Mine (Quartz).—It is 1½ miles S.W. of White River, at 1,200′ altitude. The vein is 3″ to 8″ thick, and occurs in granite. There is a tunnel on the vein 350′ long and a shaft 90′ deep. Idle. G. W. Grover, of Santa Cruz, Santa Cruz County, owner.

Mammoth Mine (Quartz).—See our XIIth Report, p. 297. It is on the Middle Fork of Tule River, 20 miles N.E. of Milo, at 6,300′ elevation. Idle. J. Goldstein et al., of Visalia, owners.

Mineral King Mines.—See under head of Silver.

Monarch Mine (Quartz).—It adjoins the Mammoth, and is on the same vein. Idle. J. Goldstein et al., of Visalia, owners.

Oliver Twist (*Ely*) *Mine* (Quartz).—See our XIIth Report, p. 296. It is 1 mile N.E. of White River, at 1,260′ elevation. Idle. O. N. Peters, of White River, owner.

Otter Mine (Quartz).—See our XIIth Report, p. 297. It is in Coarse Gold Gulch, 1¼ miles S. of White River, at 1,420′ elevation. Idle. J. W. Beaver, of White River, owner.

Page Mine (Quartz).—See under head of Copper.

Pincher & Bulger Mine (Quartz).—See our XIIth Report, p. 297. It is on Lime Creek, 23 miles E. of Visalia. Idle. J. Edwards, of Visalia, owner,

Redfield Mine (Quartz).—See Last Chance.

Richelieu Mine (Quartz).—See our XIIth Report, p. 297. It is 1½ miles S.E. of White River, at 2,250′ elevation. The vein is in granite, and is 4′ wide with 4″ to 24″ of quartz, and dips 75° N. The developments consist of a shaft 180′ deep, with drifts 165′ E. and 78′ W., and a cross-cut tunnel 155′ long. An 8 H.P. steam hoist, using ⅝″ rope and a 30″x 40″ drum, stands above the shaft. Idle. Nelson Hallock, of White River, owner.

Royal Mine (Quartz).—It is on Slate Mountain, 5 miles S.W. of White River, at 1,400′ altitude. The vein occurs in mica-schist, dips 70° N., and is 8″ wide. There is a shaft on the claim 90′ deep. Richard Roberts, of White River, owner.

Sarah Tucker Mine (Quartz).—See our XIIth Report, p. 297. C. Briggs, of White River, owner.

Simmons Mine (Quartz).—See our XIIth Report, p. 297. It is on Bald Mountain, 2 miles E. of White River, at 2,200′ elevation. The developments consist of a shaft 50′ deep, a 50′ drift at the bottom, and a 20′ winze. The vein is 4″ to 6″ wide, dips 80° N., and has granite walls. J. E. Dunlap, of White River, owner.

Stencil Mine (Quartz).—See our XIIth Report, p. 298. It is 1½ miles W. of White River, at 1,150′ elevation. A new 50′ shaft, with a 25′ drift to the E., has been made, and also a tunnel 30′ along the vein, with a winze 15′ deep. The vein averages 8″, and occurs in granite. John B. Flaugher, of White River, owner.

Sunset Mine (Quartz).—See our XIIth Report, p. 298. T. J. Mayfield, of White River, owner.

Vulture Mine (Quartz).—See our XIIth Report, p. 298. A. R. Sorrells, of White River, owner.

Way Up Mine (Placer).—See our XIIth Report, p. 298. It lies 20 miles N.E. of Camp Badger, and is worked by ground-sluicing. E. S. Balam, of Camp Badger, owner.

MILLS IN TULARE COUNTY.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of Each, in Lbs.	Capacity per 24 Hrs., in Tons.
Bald Mountain	Steam	5	650	6
Homestake	Steam	5	650	6

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN TULARE COUNTY.

Name of Mill or Mine.	Power.	Number.	Character.	Diameter.	Capacity per 24 Hrs., in Tons.
Barton	Steam	1	Huntington	3½′	2
Billy Brown	Horse		Arrastra		1

Tuolumne County.

The impression which seemed to prevail that Tuolumne County was a "pocket" mining region with no mines of a permanent character, has been completely dispelled by the developments of the past two years. All along the gold belt many old mines have been reopened, and the result of extensive developments confirms the existence of mines which give every promise of permanence and value. The new villages of Quartz Mountain and Stent (Poverty Hill) have sprung into existence, and are the direct result of the opening of valuable mines. Still farther south, at Jacksonville, the old town has been almost entirely rebuilt, and extensive operations are in progress along the Mother Lode, where two years and more ago all was dormant. There is also a revival of interest along the East Lode; the old mines are being reopened at many points, and among them many are of the most encouraging character. The changed conditions, due to cheaper labor and supplies, improved facilities and methods, are all producing a change for the better in this county. Meanwhile the "pocket" mines have been pouring out a steady golden stream, this branch of the industry being accelerated by the general revival of interest in mining. The installation of at least two electric plants, one by the Santa Ysabel Mining Co., at Quartz Mountain, and the other near Columbia, on the Stanislaus River, by the Columbia Marble Co., and their successful operation, will no doubt lead to further investments in that direction.

Ah Mow (*White Lead*) *Mine* (Placer).—See our XIth and XIIth Reports, pp. 507 and 298. It is about ½ mile N.W. of Columbia. This mine has been worked steadily during the past five years by Chinese. The gold-bearing gravel and debris are handled by means of a derrick operated by a gasoline-engine. Twelve Chinese are employed. Ah Mow et al., of Columbia, owners.

Ajax Mine (Quartz).—It is on the Majors ranch, near Roche Camp. Joseph Majors & Co., of Sonora, owners.

Alabama Mine (Quartz).—See our Xth and XIIth Reports, pp. 53, 741, and 298. It is 2 miles N.W. of Quartz Mountain, and is the first claim south of Table Mountain. In former years a large open cut was made on the vein, and a cross-cut tunnel, 200′ in length, run from the surface to the bottom of the cut. The mine has recently been reopened; the cut cleared out and a shaft started in the bottom, the gallows-frame being built in the cut. The rock raised through the shaft will be sent in cars through the tunnel. Two drifts have been run in a southerly direction on the vein, and other work inaugurated. Sixteen men are employed. Alabama Gold Mining Syndicate, of San Francisco, owner; W. E. Nevills, of Jamestown, superintendent.

Alameda Mine (Quartz).—See our Xth and XIth Reports, pp. 55 and 508. It is ½ mile N. of the Rawhide Mine, and has two tunnels, 250′ and 427′ long, respectively; the latter connecting with a shaft 200′ deep. There are also numerous drifts, open cuts, and shallow shafts along the croppings. A drift, 200′ long, in the fall of 1895, was run along the vein from the bottom of the shaft. M. B. Harriman, of Sonora, owner.

Alexander Mine (Quartz).—It is on Cobbs' Gulch, 1¼ miles S. of Priests. It has been worked for pockets. Con. Alexander, of Big Oak Flat, owner.

Alhambra Mine (Quartz).—It is a prospect, 1 mile W. of Tuttletown. Mrs. Rikert, of Sonora, owner.

Allen Mine (Quartz).—It is a prospect, ¾ of a mile N.W. of Jamestown. Howard Preston, of Jamestown, owner.

Alta and Antelope Mines (Quartz).—See our Xth Report, p. 757. They are 22 miles N.E. of Groveland, in Santa Maria District. Alta Mining Co., of Sonora, owner.

Alvarado Mine (Quartz).—It is 12 miles S.E. of Sonora, and adjoins the Buchanan on the south, forming a portion of the Chaparral property. Fred Wenzel, of Sonora, owner.

Anti-Chinese Mine (Quartz).—It is ¼ mile W. of Tuttletown. It has a 60′ shaft on a 6′ vein. William Pererra, of Sonora, owner.

App & Heslep Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 660–661, and 299. It is on Quartz Mountain, at 1,500′ elevation. After a long idleness, the mine was reopened in 1893, the old 800′ shaft cleaned out, etc. It was then decided to sink a new shaft, which is now 800′ deep. The work in this shaft was carried on from the surface and 800′ level simultaneously. The connection was made nearly midway between these points, and was a very creditable piece of engineering. Levels have been opened on a large quartz vein which lies near the foot-wall side of the great ankerite and mariposite mass, which is such a prominent feature of Quartz Mountain. The surface plant consists of a powerful double-geared water-power hoist and a new 20-stamp water-power mill of 70 tons daily capacity. Sixty-four men are employed. App & Heslep Mining Co., of San Francisco, owner; William Moorehead, of Quartz Mountain, superintendent.

Aramenta Mine (Quartz).—It is 13 miles S.E. of Sonora. See Garfield-Virginia.

Arbona Mine (Quartz).—It is in the southern outskirts of Tuttletown. The vein, from 4′ to 8′ wide, of solid quartz, contains a small percentage of iron sulphurets. P. Keeffe, of Sonora, owner.

Argall Mines (Quartz).—This group consists of the *Elgin*, *Eunice*, *Gladdis*, *McCure*, *Miranda*, and *Virginia* claims, on Big Creek, 6 miles N.E. of Groveland. The principal development is on the Elgin, where a 35′ shaft has been sunk and 100 tons of quartz extracted. Henry Argall, of Groveland, owner.

Argentum Mine (Quartz.)—See our XIIth Report, p. 299. It is situated in American Camp District, 10 miles N.E. of Columbia. J. B. Pownall, of Columbia, owner.

Atlas Mine (Quartz).—It is on Jackass Hill. The vein, a silicified diabase, strikes N. 65° W; it contains 10% or more of auriferous pyrite. Old surface excavations extend along the vein for 1,000′ or more. The principal developments consist of an open cut 50′ deep, 60′ long, and from 20′ to 30′ wide, at the bottom of which a 125′ inclined shaft has been sunk. A tunnel, 200′ long, connects with the bottom of the open cut. Idle. Joseph Podesto, of Tuttletown, owner.

Badger Mine (Quartz).—See our XIth Report, p. 508. It is 3½ miles S.W. from Tuttletown. Some prospecting was done in 1895. — Palmer, of Gilroy, owner.

Bald Mountain (*Austrian*) *Mine* (Quartz).—It is on Bald Mountain, ½ mile N.E. of Sonora. Birney & Hudson, of Sonora, owners.

Basin Mine (Quartz).—It is on the North Fork of the Tuolumne River. The vein is reported to be 1′ to 3′ wide. It is equipped with a 5-stamp steam-power mill. John Rocco, of Sonora, owner.

Beckwith & Saunders Mines (Quartz).—They are situated in Sec. 36, T. 2 N., R. 12 E., 2 miles W. of Tuttletown. Several veins of gold-bearing quartz are known to cross the property in a N.W. direction. Some superficial development has been made, and pocket-hunting carried on to a considerable extent. Beckwith & Saunders, of Tuttletown, owners.

Belcher Consolidated Mine (Quartz).—See our VIIIth Report, p. 672. It is 1½ miles N.W. of Groveland. Idle for several years.

Belle Mine (Quartz).—It is 1 mile N.W. of Tuttletown. It has a 200′ cross-cut tunnel and drifts 30′ N. and S. on the vein. Fred Sutton, of Sonora, owner.

Bellevue (*Hyde*, *Golden Treasure*) *Mine* (Quartz).—See our VIIIth, Xth, XIth, and XIIth Reports, pp. 670, 755, 501, and 299. It is 6 miles N.E. of Sonora, on land covered by an agricultural patent. The vein system occurs in grano-diorite. The incline shaft is 575′ deep. In the fall of 1895 a large vein was discovered in the lower levels which is said to be better grade than anything previously opened in the mine. The vein is 12′ to 14′ wide and has a banded structure near the walls, but is massive in the center. The quartz throughout the mine contains a very low percentage of sulphurets, unusual for veins in granite in this county. The mine is equipped with steam hoist and mill. A free water-power could easily be made available, but has been neglected. Sixteen men are employed. Bellevue Mining and Agricultural Co., of San Francisco, owner; A. McDonald, of Sonora, superintendent.

Benjamin Harrison Mine (Quartz).—It is at Jacksonville, and has been worked along the hanging-wall side for pockets. — Brown, of Jacksonville, owner.

Big Oak Flat (*Conrad*) *Mine* (Quartz).—It is on Big Oak Flat. A shaft has been sunk 50′ on a 4′ vein in granite. The quartz contains gold, tellurium, pyrite, zinc-blende, galena, gray copper, and chalcopyrite. H. A. Conrad, of Groveland, owner.

Birney (*Hammilfield*) *Mine* (Quartz).—See Hammilfield.

Black Oak Mines (Quartz).—See our VIIIth, Xth, XIth, and XIIth Reports, pp. 665, 744, 500, and 299. They are ½ mile W. of Soulsbyville, and consist of following three claims: *Black Oak*, *Live Oak*, and *White Oak*, the two latter being prospects. The Live Oak vein is nearly parallel to the Black Oak, and dips toward it. On the 600′ level the schistose appearance of the granite walls and the softening of the ground were considered an indication of the approaching union of these veins, or at least the proximity of another fissure. The quartz is heavily sulphuretted, pyrrhotite being prominent. Thirty-eight men are employed. Black Oak Mining Co., of Soulsbyville, owner; W. P. Scott, of Sonora, superintendent.

Bonanza Mine (Quartz).—See our VIIIth, IXth, Xth, XIth, and XIIth Reports, pp. 652, 37, 736, 511, and 299. Since our last Report the mine has been worked continuously. Prospecting for a parallel shoot is in progress in the upper part of the mine. Three men are employed. Harriman, Oliver, et al., of Sonora, owners.

Bonita Mines (Quartz).—They are ¼ mile S.E. of Carters, and consist of the *Bonita* and *Garfield*. The latter lies to the east, and approaches the Bonita vein going southward. They unite in the Consuella Mine, 750′ south of the Bonita. Both veins are in black slate, and each is accompanied by a light gray dike. On the Bonita vein a 440′ adit has been run, and in it, about 300′ from the mouth, a 50′ winze sunk. On the Garfield vein a 400′ adit has been driven; about 200′ beyond the present face of the adit a 70′ shaft has been sunk from the surface, and has no machinery. Breese, Angus & Blanc, of San Francisco, owners; A. Blanc, of Carters, superintendent.

Buchanan Mine (Quartz).—See our VIth (Part II), VIIIth, Xth, and XIth Reports, pp. 60, 666, 752, and 494. It is 12 miles S.E. of Sonora. Idle. — Davis and the Barton Estate, of San Francisco, owners.

Buckeye Mine (Quartz).—See Seminole.

Buzzard's Roost Mine (Quartz).—See our XIth Report, p. 506. It is 8 miles from Sonora, on the South Fork of the Stanislaus River. It has a 5-stamp water-power mill. Vivian & Gerloch, of Sonora, owners.

Canondale Mine (Placer).—It is at Columbia, and is worked intermittently. Diego Lorenzo, of Columbia, owner.

Cardinelle Mine (Quartz).—It is ¼ mile N. of Tuttletown. A shaft has been sunk 200′ in chloritic schist, on an irregular quartz vein. Some very rich rock was taken from this shaft. P. Keeffe et al., of Sonora, owners.

Carlotta Mine (Quartz).—See our XIth Report, p. 499. It is ½ mile N. of Carters, and is an E. and W. vein in granite. Idle. Fred Sutton, of Sonora, owner.

Carmelita Mine (Quartz).—It is in the Santa Maria District, 22 miles N.E. of Groveland. Neale & Carter, of Sonora, owners.

Carrie Mine (Quartz).—It is near Soulsbyville, in granite. Estate of J. T. Coleman, of San Francisco, owner.

Cave Diggings Mines (Hydraulic).—They are between the North and Middle forks of Tuolumne River, 2 miles W. of the Buchanan Mine, and contain 155 acres of land located on an ancient river channel. Water is to be taken from Big Cañon to these mines. William Sharwood, of Soulsbyville, owner.

Chaparral Mine (Quartz).—See our XIth Report, p. 496. It is 12 miles S.E. of Sonora, near the Buchanan Mine. The veins are in black slate, and are developed by several tunnels, 100′ to 600′ long, besides numerous surface cuts. Idle. Fred Wenzel, of Sonora, owner.

Chimney Rock Mine (Quartz).—It is 13 miles N. of Columbia, and near the Stanislaus River. The veins are found near the contact of mica-schists and a massive quartzose rock of the Calaveras formation. Several tunnels have been run. J. S. Sublette, of Murphy, owner.

Churchill Mine (Quartz).—It is in the town of Soulsbyville. See Soulsby.

Clio Mine (Quartz).—See our Xth Report, p. 47. It is ½ mile S. of Jacksonville, and comprises three claims of 1,500′ each in length. There are several open cuts and tunnels on the vein. It has a 10-stamp mill.

Clio Mining Co., of Boston, Mass., owner; Samuel Ambrose, of Jacksonville, agent.

Cloudman Mine (Quartz).—It is situated between Poverty Hill and Quartz Mountain, and forms a portion of the Erin-go-Bragh, which it joins on the north. Edward Fischer, of Seattle, Wash., owner.

Coffee-Mill Mine (Quartz).—It is on the north slope of Jackass Hill, ½ mile S.E. of Robinson's Ferry. It has an old shaft, now caved. McArdle Bros., of Robinson's Ferry, owners.

Colby (*Last Chance*) *Mine* (Quartz).—It is a pocket mine, in Sonora, on the Bonanza lead, and is worked by lessees. Two men are employed. Conrad & Colby, of Sonora, owners.

Columbus Mine (Quartz).—See our XIIth Report, p. 301. It is 1 mile N. of Carters. Idle. Smith Bros., of Carters, owners.

Combination Mine (Quartz).—It is 2 miles N. of the Rawhide Mine, and has only superficial development. R. Chute, of San Francisco, owner.

Comstock Mine (Quartz).—It is in slate, near Carters. C. Callender et al., of Sonora, owners.

Confidence Mine (Quartz).—See our XIth Report, p. 503. It is 13 miles N.E. of Sonora. Idle for years. The newspapers state (Nov., 1896) that the mine is being reopened and new machinery supplied. It is the principal claim of a group including the *Independence*, *Little Jessie*, and *Plowboy*. Baker & Hamilton, of San Francisco, owners.

Conlin & Bosovich Mine (Placer).—See our XIIth Report, p. 301. It is 2 miles E. of Columbia, and is worked by derricks run by water-power. Four men are employed. Conlin & Bosovich, of Columbia, owners.

Conlin & Graham Mine (Quartz).—See our XIIth Report, p. 301. It is 2½ miles S.E. of Columbia. Idle. Conlin & Graham, of Columbia, owners.

Consolidated Eureka Mine (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 664, 750, 498, and 301. It is at Carters (Summerville), and includes the *Dead Horse* and *Eureka* mines. The latter was shut down several years ago, after a successful career. The old workings are connected with those of the Dead Horse down to the 1,280′ level. The former has an incline shaft 1,400′ deep. The vein is of the branching type, characteristic of the East Lode. A fine-grained mica-schist is found in the hanging-wall, and a more quartzose semi-schistose rock on the foot-wall. The vein is usually found separated from the true hanging-wall by a granite dike, which in places also makes its appearance on the foot-wall side. The workings expose a quartz vein, 1′ to 14′ wide, which is usually richer in the narrow, banded portions than in that which is broad and massive. The surface plant includes a hoist and 20-stamp water-power mill. Thirty-one men are employed. A. Hayward et al., of San Francisco, owners.

Consuella Mine (Quartz).—See our XIIth Report, p. 301. It is 1½ miles S.E. of Carters, and E. of the North Fork of the Tuolumne River. The developments have been made on each side of a gulch cutting the vein. On the north side a 300′ tunnel has been run and connected by a 125′ shaft with the surface, about 100′ from the face. A winze continues 75′ below the level, making a total depth of 200′ in the shaft. This work has been done on what is called the Mexican shoot, which averages 5′ in width. On the south side of the gulch is the McCarthy shoot, which is at and near the intersection of the Consuella and Garfield veins.

(See Bonita.) An adit on the Consuella, 290′ long, intersects a shaft, 152′ deep, at 100′ from the surface. The shoot is 2½′ to 14′ wide, averaging 5′ where exposed in the workings. D. B. Warfield, of Oakdale, owner.

Cosmopolite Mine (Quartz).—See our XIth and XIIth Reports, pp. 494 and 301. It is ½ mile S.E. of Big Oak Flat. It has been worked for pockets for many years. Four men are employed. Poole, Reid, et al., of Groveland, lessees.

Cowen Mine (Quartz).—It is at Sonora, on the Bonanza lead, and is worked by lessees for pockets. Two men are employed. Oliver Cowen, of Sonora, owner.

Crown Point Mine (Quartz).—It is 10 miles S.E. of Sonora, between Hunter's Cañon and the North Fork of Tuolumne River. The vein is 3′ wide in black slate. Madden & Co., of San Francisco, owner.

Crystalline Mine (Quartz).—See our Xth Report, p. 742. It is 1¾ miles N.W. of Quartz Mountain, and includes the Harris, or Winnie claim. There are several tunnels and a large open cut, exposing the vein. Active work is in progress. Ten men are employed. Rapp & Schaffer, of San Francisco, owners.

Darrow Mine (Quartz).—See our XIIth Report, p. 301. It is 3½ miles W. of Sonora, and is worked for pockets. Three men are employed. Darrow & Sons, of Sonora, owners.

Dead Horse Mine (Quartz).—See Consolidated Eureka.

Dorsey Mine (Quartz).—It is at Sonora, on the Bonanza lead. Mrs. Dorsey, of Sonora, owner.

Draper Mine (Quartz).—See Whitto.

Duffield Mine (Quartz).—It is near Arrastraville, 11 miles N.E. of Sonora. The vein is from 12″ to 18″ wide. Scanavino Bros., of Arrastraville, owners.

Dundero Mine (Placer).—It is 2½ miles E. of Columbia. It is worked every spring and summer by ground-sluicing. Louis Dundero, of Columbia, owner.

Dutch Mine (Quartz).—See our Xth and XIth Reports, pp. 51 and 509. It is at Quartz Mountain. The shaft had reached a depth of 430′ on August 1, 1896. There is also an air-shaft 200′ deep, connected with the main shaft. Several levels have been opened, the longest being 450′. One shoot is known to be 210′ in length, with ore still in both faces. Several cross-cuts show the channel to consist of an ankerite and mariposite mass, with quartz veins and talc-schist. A new, large working-shaft will be sunk when the extent and trend of the ore-shoot have been determined more fully. Within the past year 5 stamps have been added to the mill, making 10 in all. The capacity is 25 tons per day. The rock contains nearly 3% sulphurets, which are saved on 4 Frue vanners. Thirty men are employed. Dutch Mining and Milling Co., of San Francisco, owner; Albert Trittenbach, of Quartz Mountain, superintendent.

Eagle Mine (Quartz).—See our Xth Report, p. 48. It is on Blue Gulch, 2 miles N.W. of Jacksonville. It is an old mine being reopened in connection with the Shawmut Mine. The massive white croppings form a striking feature of the landscape. A long tunnel run in the foot-wall serpentine years ago has been cleaned out and retimbered. (See Shawmut.) Eleven men are employed. L. Rosenfield, A. Halsey, et al., of San Francisco, owners; A. Halsey, of Jacksonville, superintendent.

East Lode Mine (Quartz).—It is ½ mile W. of Tuttletown, and has four shafts, 25′ to 65′ in depth, and a tunnel 130′ in length. Patrick Mullins, of Tuttletown, owner.

Elgin Mine (Quartz).—See Argall.

Erin-go-Bragh Mine (Quartz).—It is at Stent, between Quartz Mountain and Golden Rule Hill. It has only superficial development. Edward Fischer, of Seattle, Wash., owner.

Esterbrook Mine (Quartz).—See Hazel Dell.

Eunice Mine (Quartz).—See Argall.

Eureka Mine (Quartz).—See Consolidated Eureka.

Eureka Mine (Quartz).—See our XIIth Report, p. 302. It is in Sonora. There are two veins about 20′ apart, one in black slate, the other in chlorite-schist. The former vein has a shaft 120′ deep, and the latter one 25′ deep, with a 20′ drift at the bottom. J. T. Faxon, of Sonora, owner.

Evans (*Morse & Evans*) *Mine* (Quartz).—See Hazel Dell.

Excelsior Mine (Quartz).—It is 2½ miles N.E. of the Confidence Mine. It was worked in the 60's and is said to have produced half a million dollars, much of the quartz milling $60 per ton. An incline shaft was sunk to a depth of 225′, where a fault was encountered and all work was suspended, since which time nothing has been done. Fred Sutton, of Sonora, owner.

Fairview (*Last Chance*) *Mine* (Quartz).—It is in Sonora, on the Bonanza vein, being a portion of the original Last Chance location. Two men are employed. Colby & Conrad, of Sonora, owners.

Fischer Mine (Quartz).—It is ½ mile W. of Tuttletown, and has a shaft 80′ deep. It has a 5-stamp mill. Idle. J. A. Fischer, of Sonora, owner.

Florence Mine (Quartz).—See our XIIth Report, p. 302. It is 1 mile S.E. of Tuttletown. H. Orlando, of Tuttletown, owner.

Ford Mine (Quartz).—It is on Bald Mountain, 1 mile N.E. of Sonora. Two men are employed. — Ford, of Sonora, owner.

Gamble Mine (Quartz).—It is 1 mile S. of Groveland, and is worked for pockets. Winslow Hubbard, of Groveland, owner.

Garfield-Virginia Mine (Quartz).—See our XIIth Report, p. 302. It is 1 mile S. of the Buchanan Mine, and embraces the *Aramenta*, *Virginia*, and *Garfield* claims. A tunnel is being run on the Garfield near the Tuolumne River; it is in 300′, and a large quartz vein has been cut. The property is well situated for economical working. Four men are employed. Garfield-Virginia Mining Co., of Sonora, owner; J. W. Purdy, of Sonora, superintendent.

Garrett Mine (Quartz).—It is on Bald Mountain, 1 mile N.E. of Sonora, and is worked by lessees. Five men are employed. Garrett Bros., of Sonora, owners.

Georgia Mine (Quartz).—See Seminole.

Gladdis Mine (Quartz).—See Argall.

Gladstone Mine (Quartz).—See our XIth Report, p. 510. It is on Kanaka Creek, 1 mile E. of Jacksonville. It has considerable superficial development. Thomas Whitto et al., of Sonora, owners.

Gloster Mine (Quartz).—It is 2 miles S.E. of Carters, joining the Consuella Mine. A tunnel has been run 350′ on the vein from Nigger Gulch, connecting with a shaft 100′ deep. A 25′ cross-cut tunnel has also been run, near the north end of the mine, to the vein, and a 40′

drift run along it. The vein averages 5′, and the pay-streak 2′, in width. The quartz is worked in arrastras. One man is at work. James Gloster, of Carters, owner.

Godfrey (*Stanley & Bean*) *Mine* (Quartz).—It is on the Joyce ranch, 4 miles N. of Groveland. Two shafts, 35′ and 135′ deep, respectively, have been sunk on an irregular vein in mica slate. Several hundred tons of the vein quartz, mixed with country rock, have been milled. The mine is being reopened under new management. Five men are employed. E. L. Lowe et al., of San Francisco, owners; T. G. McGuire, of Groveland, superintendent.

Gold Bug Mine (Quartz).—It is 1½ miles N.W. of Big Oak Flat. Considerable superficial work has been done on veins, about 12″ wide, in search of pockets. The latest development is on a dike, 18″ wide, that prospects well in gold. There is little or no quartz accompanying the dike, which cuts the black slate. One man is employed. R. T. Sorenson, of Big Oak Flat, owner.

Gold Hunter Mine (Quartz).—It is on the East Lode, 11 miles S.E. of Sonora. It has several tunnels and shafts of unknown extent. The machinery has fallen into decay. P. J. Sullivan, of San Francisco, owner.

Gold Nugget Mine (Quartz).—See Merritt.

Golden Eagle Mine (Quartz).—It is on Big Oak Flat. Undeveloped.

Golden Gate Mine (Quartz).—See our Xth, XIth, and XIIth Reports, pp. 738, 511, and 302. It is 1 mile S.W. of Sonora. The shaft is 725′ deep. Since our last Report considerable exploration has been done—cross-cutting, etc.—but the mine is no deeper. Several new pay-shoots, it is claimed, have been discovered in the cross-cuts. The 10-stamp mill has been enlarged to 20 stamps. Twenty men are employed. Consolidated Golden Gate and Sulphuret Mining and Development Co., of Sonora, owner; Samuel Smitherum, of Sonora, superintendent.

Golden Rock Mine (Quartz).—It is on the north side of Big Oak Flat, and is worked for pockets. It has a 40′ shaft, a tunnel over 400′ long, and numerous open cuts. A new tunnel is projected, to cut the vein under the shaft at a depth of 150′ from the surface. One man is employed. H. A. Conrad, of Groveland, owner.

Golden Rule Mine (Quartz).—See our Xth Report, p. 50. It is on Golden Rule Hill, ½ mile S. of Stent, or Poverty Hill. The mine was worked in the 60's and early 70's to a depth of 200′ and produced $38,500 in 1870 and $10,000 in 1871. (See Mineral Resources West of the Rocky Mountains, for 1871 and 1872, pp. 33 and 62.) Open cuts are found on two separate veins of amphibolite-schist. Recently the mine has been reopened and a large amount of development work done. The adit level is a cross-cut, 528′ long, and enters the hill from the west, or foot-wall, side. The main drift runs N. and S. from the tunnel, and is nearly 1,000′ long on a zone of chlorite-schist, containing gold and auriferous pyrite, and along the foot-wall side of the zone narrow veins of quartz and calcite, rich in gold; associated with this streak is a dike which is often found to contain a reticulated mass of veinlets of quartz and calcite, also rich in gold. A 70′ shaft connects with the surface 150′ from the north face of the drift. A cross-cut has been run 200′ W. from a point near the shaft, which exposes two other gold-bearing zones or veins, separated by 20′ of diorite. One of these veins is gold-bearing amphibolite-schist; the other is much altered ankerite, with mariposite, containing quartz gold and auriferous pyrite. The hanging-wall country rock for 1,000′ or more east of the more easterly vein is composed entirely of amphibolite-schist, with small veins of quartz and dikes, and has been sluiced off years ago. It is not improbable that this schistose rock will also be found to contain auriferous zones. East of this schistose area is diabase of a normal type. The west or foot-wall country consists of diorite, separated from the lode by a strip of serpentine over 100′ wide. The cross-cut is started in this rock. The succession of rocks as exposed in the cross-cut is a large mass of greatly altered ankerite, with mariposite, separated from the serpentine by a heavy gouge. A dike of diorite, similar to that in the west country, separates the ankerite mass from a second similar zone. Lying east of the ankerite zone is a succession of diorite and diabase rocks, partly altered into amphibolite-schist, which in the zones above described are gold-bearing. On the surface a large quartz cropping is seen on the hanging-wall side of the ankerite area, which has not as yet been found in any of the underground workings. The above geological description may be taken as characteristic of the Mother Lode belt in Tuolumne and Mariposa counties. It would seem that the amphibolite-schists should receive more attention. A 5′ x 9′ double-compartment shaft, now 270′ deep, is being extended to 600′ in depth. The 10-stamp water-power mill is idle. Twelve men are employed. Golden Rule Mining Co., of Stent, owner; E. A. Stent, of Stent, superintendent.

Golden Star Mine (Quartz).—It is a pocket mine, near Big Oak Flat. It has a tunnel 500′ long. James Bros., of Groveland, owners.

Good Shepherd Mine (Quartz).—It is 3 miles N. of Soulsbyville, and is a new prospect, in granite. A shaft is being sunk on the vein, which averages 12″ in width. Three men are employed. W. H. Barron, of Soulsbyville, owner.

Grant Mine (Quartz).—It is near Moccasin Creek, at the foot of Priest's Hill. A shaft has been sunk 100′ on a dike containing 4% or 5% of pyrite. A cross-cut is being driven east in the foot-wall to cut the dike. Two men are employed. Grant Gold Mining Co., of Oakland, owner; J. J. Hughes, of Chinese Camp, superintendent.

Gray Eagle Mine (Quartz).—See Santa Ysabel.

Grizzly Mine (Quartz).—It is on the East Lode, 1 mile S.E. of Carters. It has a shaft 100′ deep. Idle. William Sharwood et al., of Soulsbyville, owners.

Grizzly-Eureka Mine (Quartz).—It is ¼ mile N. of Priests. The property comprises two claims, on each of which considerable work has been done. The gold is found in black slate at the contact with or near small dikes of intrusive rock, which cut the formation. Considerable gold was also found along a fault that had dislocated a small quartz vein. The displacement was only a few inches. Two men are employed. Harper Bros., of Groveland, owners.

Gross Mine (Quartz).—It is at Tuttletown, and has a shallow shaft. Frank Gross, of Tuttletown, owner.

Hammilfield (*Ham & Birney*) *Mine* (Quartz).—It is on Five-Mile Cañon, 7 miles N.E. of Columbia. The vein dips 25° to 30° S.E., and strikes N.E., in mica-schist and quartzite of the Calaveras formation, and has a dike on one or both walls. It is 1′ to 6′ wide, and is worked through six adits, which are from 100′ to 380′ long, the four upper ones being about the latter length. There is a 10-stamp mill, but no concentrators, the quantity of sulphurets being very small. Operations suspended. Hammilfield Mining Co., of San Francisco, owner; William Sharwood, of Soulsbyville, superintendent.

Hancock Mine (Quartz).—It is 2½ miles W. of Tuttletown, near Daniels Flat. The main vein is exposed in an open cut and 60′ shaft. This work has been done at a point where a split occurs in the vein, one branch turning off in a sweeping curve to the west. Pablo Rodriguez, of Tuttletown, owner.

Hayes Mine (Quartz).—It is on the south side of Tuolumne River, 2 miles S.E. of Jacksonville. Developed by several short tunnels. Thomas Hayes, of Jacksonville, owner.

Hazel Dell Mines (Quartz).—They are 9 miles N. of Soulsbyville, and consist of the *Esterbrook*, *Evans*, and *Hazel Dell*. The veins are from 1′ to 3′ wide, and are found partly in the mica-schist and quartzite of the Calaveras formation and partly in grano-diorite. The most easterly vein is the Esterbrook, on which is a cut 30′ long and 12′ deep, exposing a vein 1′ thick, accompanied by a dike. The next vein, on the Hazel Dell, lies 580′ N. and is 2′ to 2½′ wide, which is also accompanied by a dike. The principal vein of the Hazel Dell lies 190′ N. of the last described, and is from 12″ to 30″ wide, with a dike on the hanging-wall side. It has a shaft 80′ deep and a tunnel 100′ long on the vein, cutting the shaft 30′ from the surface. A small mill was built here years ago. Afterward a cross-cut tunnel was started in Sawmill Gulch, about 400′ from the vein, the object being to drain the mine and work more economically. All the operations were suspended when work on the tunnel ceased in 1854; since which time nothing has been done until recently. The mine has been cleaned out and prospect work is being done. There is a large amount of fine-appearing quartz, carrying sulphurets of iron, lead, and copper. The Evans vein is in grano-diorite, and 580′ N. of the Hazel Dell; a shaft, now caved, was sunk in early days, and a mill built. It was afterward burned, and the mine has been idle for years. Three men are employed. William Sharwood, of Soulsbyville, owner.

Hector Mine (Quartz).—It is 3 miles N.W. of Jacksonville. It was worked in early days, but these workings are now closed. J. L. Whitney, of Quartz Mountain, owner.

Henrietta Mine (Quartz).—See our XIIth Report, p. 302. It is on the North Fork of Tuolumne River, 4 miles N.E. of Carters. The vein is heavily sulphuretted. C. F. Haslam, of Sonora, owner.

Heslep Mine (Quartz).—See App & Heslep, and our VIIIth and Xth Reports, pp. 661 and 51.

Hibbing Mine (Quartz).—It is 1 mile N. of Soulsbyville. It has a shaft 70′ deep, on a vein in granite. Idle. Hibbing Bros., of Soulsbyville, owners.

Hidden Treasure Mine (Quartz).—It is 1¼ miles S.W. of Priests, near Cobbs Creek. This is a new prospect, on which there are several open cuts and a 40′ shaft, in a mass of diorite of coarse texture, abundantly impregnated with pyrite, quartz, and calcite. Two men are employed. Rhodes & Flack, of Stockton, owners.

Hitchcock Mine (Quartz).—It is on Quartz Mountain. See App & Heslep.

Hoffman (*Ready*) *Mine* (Quartz).—It is 4½ miles N. of Groveland. It has a shaft 135′ deep.

Homestake (*Rising Sun*) *Mine* (Quartz).—It is on the south side of Blue Gulch, 1½ miles N. of Jacksonville. A tunnel is being driven on the vein from the north. Two men are employed. Judge Waymire, of Alameda, owner.

Homestead Mine (Quartz).—It is situated on the North Fork of Tuolumne River. The vein is 2′ to 3′ wide. Charles Howland, of Los Angeles, owner.

Hope Mine (Quartz).—It is on the Bonanza lead, ½ mile E. of Sonora, and is worked in a small way. Two men are employed. Ralston & Arillo, of Sonora, owners.

Hyde Mine (Quartz).—See Bellevue.

Independence Mine (Quartz).—It is ¼ mile N.E. of Tuttletown, and has some superficial development, made in searching for pockets. W. E. Neville and John Penrose, of Tuttletown, owners.

Independence Mine (Quartz).—See Confidence; also our XIth Report, p. 503.

Isabella and Gem Mine (Quartz).—It is ¼ mile N. of the Rawhide Mine, and is well situated for economical development and working. It has a 30′ shaft, and a tunnel is now being run by contract. Two men are at work. J. T. Faxon, of Sonora, owner.

James Mine (Quartz).—It is a pocket mine, 1 mile N.W. of Groveland. James Bros., of Groveland, owners.

Joe Hooker Mine (Quartz).—It is in the granite, near Carters, and has a small vein of what is claimed to be good pay quartz. The equipment consists of a 5-stamp water-power mill. P. B. Bacon, of Sonora, owner.

Jumbo Mine (Quartz).—It is on the Burns ranch, 1 mile W. of Soulsbyville. The vein, 4′ to 8′ wide, strikes E. and W., in granite. A 90′ shaft and several surface cuts constitute the development. It is now flooded and idle. James Burns, of Soulsbyville, owner.

Jumper Mine (Quartz).—See our Xth Report, p. 50. It is on the south end of Golden Rule Hill, ¾ mile S. of Stent. The shaft is 320′ deep, and levels have been run from the 100′, 200′, and 300′ stations. It is quite similar to the Golden Rule, geologically. It is equipped with a steam hoist and a new 20-stamp mill, with 1,030-lb. stamps; no concentrators. Fifty men are employed. Jumper Gold Mining Syndicate, of Glasgow, Scotland, owner; H. W. Coffin, of Stent, superintendent.

Junction Mine (Quartz).—It is on the Yost ranch, 1 mile S. of Soulsbyville, on what is presumed to be the junction of the *Black Oak* and *Soulsby* veins. At present the development is superficial, but a shaft is being sunk by a company which has bonded the property. Six men are to be employed. John Yost, of Soulsbyville, owner.

Kaiser Mine (Quartz).—It is on Bald Mountain, 1 mile N.E. of Sonora, and is worked for pockets. F. W. Buckwalter, owner.

Kanaka Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 669 and 303. It is 5 miles E. of Groveland. Since our last Report a crosscut tunnel has been driven into the vein from a point back of the mill, which greatly facilitates the working of the mine. The mill is only run during the season when water is abundant. Five men are usually employed. Louis Cassaretto, of Groveland, owner.

Karrington (*Stenchfield*) *Mine* (Quartz).—It is on Jackass Hill, 1¼ miles N.W. from Tuttletown, and is one of the noted pocket mines of the locality. Four men are employed. James Gillis, of Tuttletown, owner.

Keltz Mine (Quartz).—See our VIth (Part II), Xth, XIth, and XIIth Reports, pp. 59, 755, 504, and 303. It is 10 miles N. of Soulsbyville, on the cañon of the South Fork of Stanislaus River. It has been worked continuously during the past two years. It has four adit levels, from 400′ to 1,100′ in length; the quartz from the upper levels being sent to the mill by inclined tramways. The vein occurs in the slates and quartzites of the Calaveras formation, accompanied by a dike, being similar geologically to many of the mines of the East Lode. Formerly the mine had two mills of 10 stamps each. The old mill, standing on an insecure foundation, on a steep mountain side, was torn down and 5 stamps added to the mill built in 1893. The capacity of the mill is now 30 tons daily. Twenty-six men are employed. The Leechman Prospecting Co., of San Francisco, owner; William Sharwood, of Soulsbyville, superintendent.

Kelvin Mine (Quartz).—It is on the North Fork of Stanislaus River, and has a vein 2′ to 5′ wide. Leechman & Co., owners.

Kephart Mine (Quartz).—It is 2½ miles S.W. of Carters, and is in the prospective stage. S. Kephart, of Carters, owner.

King Solomon Mine (Quartz).—It is ¾ of a mile W. of Tuttletown, and is opened by a cross-cut tunnel 200′ long, from which drifts 100′ long have been run. The mineralized zones have been intersected by the cross-cut, and show considerable quartz and chloritic-schist containing auriferous pyrite. Three men are employed. A. O. Viertong, of Tuttletown, owner.

Knox & Boyle Mine (Quartz).—See Santa Ysabel, and our Xth Report, p. 51.

Kriss-Kross Mine (Quartz).—See our XIIth Report, p. 303. It is a pocket mine, 1 mile N. of Priests. It has a shaft and two tunnels. J. J. Hughes, of Chinese Camp, owner.

Lady Washington Mine (Quartz).—See our Xth, XIth, and XIIth Reports, pp. 752, 498, and 303. It is ¼ mile S.E. from Carters, joining the Dead Horse on the south. The mine has several adits, from 100′ to 300′ in length. Idle. — Hooper et al., of San Francisco, owners.

Lamphyre Mine (Quartz).—See our XIth Report, p. 503. It is at Confidence, and has been dismantled; the machinery being taken to the Rappahannock Mine. Richard Chute, of San Francisco, owner.

Last Chance Mine (Quartz).—It is on Kincaid Flat, 3 miles S. of Sonora. A shaft is being sunk on a vein of peculiar, watery quartz, 3′ to 5′ wide, which is quite rich in gold. It also carries auriferous iron and copper sulphurets. Three men are employed. William Hunter, of Sonora, owner.

Last Chance (*Colby*) *Mine* (Quartz).—It is a pocket mine in Sonora, on the Bonanza lead, and is producing handsome specimens. Two men are employed. Colby & Conrad, of Sonora, owners.

Laura and North Star Mine (Quartz).—See our XIth and XIIth Reports, pp. 498 and 303. It is on the East Lode, between Carters and Cherokee. These claims are worked as one mine. The Laura has a 400′ and the North Star a 200′ shaft. The veins, of which there are several, lie nearly parallel in granite. Several cross-cuts have been run and other underground prospecting done since 1893, but all work was suspended in 1895, and the mines are now flooded. Laura and North

Star Mining Co., of Sonora, owner; D. Oliver, of Sonora, superintendent.

Lead Mine (Quartz).—See our Xth Report, p. 56. It is ½ mile W. of Tuttletown. In former years it is claimed this mine produced some very rich gold quartz, and also contained considerable galena. The pay-rock is found in a mass of ankerite and mariposite, between walls of amphibolite-schist. A shaft has been sunk, and a cross-cut tunnel is being driven to reach a point on the vein under the shaft. Four men are employed. W. B. Clement, of Tuttletown, owner.

Lena Belle Mine (Quartz).—See Seminole.

Little Gem Mine (Quartz).—See our VIIIth, Xth, and XIth Reports, pp. 663, 742, and 506. It is 1 mile W. of Jamestown. It is a fractional claim, which cuts out a portion of the rectangular Trio claim. The excavations have been chiefly in the amphibolite-schists, which lie east of the massive vein of quartz and ankerite. It has a 10-stamp mill, run by a 30′ overshot water-wheel. Four men are usually employed. Hensley Bros., of Jamestown, owners.

Little Jessie Mine (Quartz).—See Confidence.

Little Wonder Mine (Quartz).—It is 2 miles N.W of Big Oak Flat. The two veins occur in black slate, accompanied by dikes. The quartz is banded, and contains pyrite and a small percentage of galena. The veins are opened by inclines and several surface cuts. Three men are employed. Bonded to David Hartz, of Big Oak Flat.

Live Oak Mine (Quartz).—See Black Oak.

Longfellow (*Butler*) *Mine* (Quartz).—See our VIIIth and XIth Reports, pp. 672 and 494. It is on the north side of Big Oak Flat. A 140′ shaft was sunk some years ago. Idle. D. F. Longfellow, of Big Oak Flat, owner.

Lookout Mine (Quartz).—See Peña Blanco.

Louisiana Mine (Quartz).—It is 1 mile N.W. of Carters. Until recently it has been idle, and flooded since 1881, but was reopened in 1895. The shaft was found to be 370′ deep. The vein is in granite. The mine is equipped with water-power hoist, with a steam plant as accessory. No mill. Operations are again suspended. Margaret McCormick, of Sonora, owner.

Lucky Star Mine (Quartz).—See Peña Blanco.

Lumsen Mine (Quartz).—See our XIth and XIIth Reports, pp. 494 and 303. It is worked occasionally for pockets. D. Lumsen & Son, of Big Oak Flat, owners.

Mack Mine (Quartz).—It is on the north side of Big Oak Flat. The vein runs from a few inches to 8′ thick, in grano-diorite. A new shaft has been sunk 150′ and a cross-cut tunnel run 100′. It has a good hoisting and pumping plant. Five men are employed. Albert Mack et al., of Big Oak Flat, owners.

Mammoth (*Webster*) *Mine* (Quartz).—See our Xth Report, p. 47. It is ½ mile N. of Jacksonville. The claim is 2,200′ in length. The property has been opened extensively, and development is still in progress. Driven to the vein from the west there are four cross-cut tunnels, 80′, 190′, 340′, and 673′ long, respectively; the last being the lowest and main adit; it has intersected a large vein, and a station was cut out in the hanging-wall, a winze sunk, and a complete hoisting plant installed. Grading for a 10-stamp mill has been completed. A ditch and flume, 4 miles in length, have also been built, from the confluence of Woods and Sullivan creeks, to furnish 500 miner's inches of water under 100′ pressure. The

Orcutt Mine, adjoining the Mammoth on the south, constitutes a portion of the property, and will be worked jointly with it. Thirty-eight men are employed. Sierra Buttes Mining Co., of San Francisco, owner; J. F. Bluett, of Jacksonville, superintendent.

Martha Washington Mine (Drift and Hydraulic).—See our XIIth Report, p. 303. It is on Table Mountain, 5 miles W. of Chinese Camp. Idle. Martha Washington Mining Co., of Oakland, owner.

Mary Mine (Quartz).—It is 1 mile N.E. of Arrastraville, and has a 4′ vein. W. H. Barron, of Soulsbyville, owner.

Mary Ellen Mine (Quartz).—See our XIth Report, p. 494. It is 5 miles N. of Groveland. Idle. Jabez Howes, of San Francisco, owner.

Marryat Mine (Quartz).—It is at Tuttletown, and has been opened to a depth of 200′, but is now dismantled. James Gillis, of Tuttletown, owner.

Mascot Mine (Quartz).—It is a prospect, 1½ miles W. of the Rawhide Mine. Mrs. Rickert, of Sonora, owner.

May & Hunter Mine (Quartz).—It is on Wolfley's Hill, ¼ mile E. of Sonora, and is worked for pockets. Two men are employed. Charles Lang, of Sonora, owner.

Mayflower Mine (Quartz).—It is 1 mile S.W. of Carters, and is a claim of the Seminole group. Several tunnels have been run cross-cutting the formation, the longest being 300′. These workings pass through a zone of brecciated rock, which appears to have been mica-schist and quartzite, but now much altered and intruded by irregular masses and veinlets of dike rock. The entire zone, 65′ wide, is very soft, much decayed, and stained with iron oxide. Gold is found near the foot-wall side, where some stoping has been done on a vein-like mass, consisting of a peculiar cellular, semi-opal quartz. Two men are employed. Seminole Mining Co., owner; J. L. Coles, of Carters, manager.

Mazeppa Mine (Quartz).—See our XIth Report, p. 509. It is a prospect, 1 mile S. of Stent. It has a 60′ shaft and several surface cuts. A new shaft is being sunk, under contract by parties holding a bond on it. Four men are employed. William Harris, of Jamestown, owner.

McAlpine Mine (Quartz).—See our Xth Report, pp. 43 and 44. It is 4 miles N.W. of Coulterville. Idle. Estate of Peter Wynans, of Oakland, owner.

McCann Mine (Quartz).—It is ½ mile W. of Jamestown, and has only superficial development. A. Hayward et al., owners.

McCure Mine (Quartz).—See Argall.

McTarnahan Mine (Drift).—It is 2½ miles W. from Sonora, on the Table Mountain channel. A tunnel has been driven, through slate bedrock, from the west side of the mountain to tap the channel. Two men are employed. Frank McTarnahan, of Sonora, owner.

Means & Wilson Mine (Quartz).—It is on Jackass Hill, 1¼ miles N.W. of Tuttletown. It has been famous for years as a pocket mine. The formation is amphibolite-schist, through which is found numerous parallel fissures and many small seams of quartz and calcite. The gold pockets are found at the intersection of seams and veins, or fissures, and are frequently found associated with small dikes. The surface is a labyrinth of holes, where miners have been working for years. The mine is now worked by a system of leases, six separate parties working various portions of the property. Twelve men are employed. James Gillis, of Tuttletown, owner.

Merritt and Gold Nugget Mines (Quartz).—They are 2 miles S. of Big Oak Flat, and form a single property, which has been opened since our last Report. A 110′ shaft has been sunk, with windlass and horse-whim, and the owner is about to put in a steam hoist. The vein is opened at various points along 1,000′ or more of the surface, and is found to be from 2′ to 5′ wide. It consists of a zone of slate and quartz, carrying a small percentage of sulphurets. The walls are well defined. Four men are employed. E. B. Burdick, of Groveland, owner.

Mexican Mine (Quartz).—See Urquhardt.

Miller & Holmes Mine (Quartz).—See Santa Ysabel, and our XIIth Report, p. 304.

Mina Verde Mine (Quartz).—It is on the South Fork of Tuolumne River. The vein is 1′ to 2′ wide. Bluett & Co., of Columbia, owners.

Miranda Mine (Quartz).—See Argall.

Mississippi Mine (Quartz).—It is on the lower end of Big Oak Flat. It was reopened in 1894 and a hoist and mill built, but after cleaning out the shaft, work was suspended, since which time it has been idle. John McLaughlin, of Coulterville, Mariposa County, owner.

Mohawk Mine (Quartz).—It is on the North Fork of Tuolumne River. The vein is 2′ wide. E. C. Brooks, of San Francisco, owner.

Monitor Mine (Quartz).—It is 3 miles N.W. of Confidence, on the North Fork of Tuolumne River. The vein averages 2′ in width. John Neale et al., of Sonora, owners.

Monte Cristo Mine (Quartz).—It is 25 miles E. of Groveland, in Santa Maria District. The vein is 20″ wide, and is in granite. John H. Neale et al., of Sonora, owners.

Mooney Mine (Quartz).—It is 1 mile N. of Quartz Mountain. A 20′ cross-cut tunnel has been driven, cutting the vein 40′ from the mouth. A. Hayward et al., of San Francisco, owners.

Mormon Mine (Quartz).—It is a prospect on Big Oak Flat, and is an extension of the Mississippi. Idle. F. Marconi et al., of Big Oak Flat, owners.

Mother Lode Mine (Quartz).—It is ¾ of a mile W. of Tuttletown, and is opened by two tunnels, 150′ and 380′ long, respectively. Two men are employed. Patrick Mullins, of Tuttletown, owner.

Mount Jefferson Mine (Quartz).—See our XIIth Report, p. 304. It is at Groveland. Idle and inaccessible. J. H. Brown, of Boston, Mass., owner.

Mount Stanislaus Mine (Quartz).—It is on the north slope of Jackass Hill, 1½ miles N.W. of Tuttletown. Only superficial workings. McArdle Bros., of Robinson's Ferry, owners.

Mount Vernon Mine (Quartz).—It is 2½ miles N.E. of Confidence. Four cross-cut tunnels have been driven in from the hanging-wall side, two of which have reached the vein. It was worked in the 50's, and is said to have been rich. Fred Sutton, of Sonora, owner.

Mount Zion Mine (Quartz).—It is 1 mile E. of Groveland and has a 100′ shaft. Idle. Louis Casseretto, of Groveland, owner.

Neale Mine (Quartz).—It is ½ mile E. of Sonora, and is worked for pockets. Four men are employed. Mrs. J. H. Neale, of Sonora, owner.

Never-Sweat Mine (Quartz).—See our XIIth Report, p. 304. It is 1 mile N.E of Priests. Since our last Report, a 300′ cross-cut tunnel has been driven toward the vein. One man is at work. James Ballentine, of Big Oak Flat, owner.

Never-Sweat Mine (Quartz).—It is 1 mile N. of Columbia, and is worked in a desultory way for pockets. Peterson & Keefe, of Columbia, owners.

New Albany Mine (Quartz).—See our VIIIth, Xth, XIth, and XIIth Reports, pp. 665, 752, 497, and 304. It is on the North Fork of Tuolumne River, 1 mile N.E. of Carters. The operations, commenced in 1893, were of short duration. Idle. Ballard & Martin, of San Francisco, owners.

New Era Mine (Quartz).—See our XIth Report, p. 509. It is situated between the *Golden Rule* and *Jumper* mines. It has an 80′ shaft and a few surface cuts. A drift is being run from the 200′ station of the Jumper Mine into this ground. Jumper Gold Mining Syndicate, of Glasgow, Scotland, owner; W. H. Coffin, of Stent, superintendent.

Nonpareil Mine (Quartz).—It is 1½ miles N.W. of Groveland. Idle. Joseph Raggio, of Groveland, owner.

Noonday Mine (Quartz).—It is on Rose Creek, above Italian Bar. The vein is 2′ to 3′ wide. It has a 5-stamp mill. Woodside & Co., of Oakdale, owners.

North Extension Mine (Quartz).—It is 2½ miles N. of Table Mountain, and has only superficial development. R. Chute, of San Francisco, owner.

North Fork (*Donnella*) *Mine* (Quartz).—See our XIIth Report, p. 304. It is 2½ miles N.E. of Carters. Since our last Report a new shaft has been sunk 150′, and a vein, presumed to be the extension of the one faulted near the surface, has been found. Thomas Soulsby, of Soulsbyville, owner.

North Star Mine (Quartz).—See Laura and North Star.

North Star Mine (Quartz).—It is 1½ miles N.W. of Jacksonville. A cross-cut tunnel is being driven through the foot-wall country rock which is calculated to reach the vein in 400′. Five men are employed. North Star Mining Co., of Chinese Camp, owner; C. C. Stone, of Jacksonville, superintendent.

Nubaumer Mine (Quartz).—It is a prospect, on Thompson Hill, 1 mile N. of Tuttletown. — Nubaumer, of Tuttletown, owner.

Nyman Mine (Quartz).—See Santa Ysabel.

Ohio Mine (Quartz).—It is 3 miles N. of Soulsbyville. The vein is in granite and about 1′ in width. It has a 5-stamp water-power mill. P. B. Bacon, of Sonora, owner.

O. K. Mine (Quartz).—See our XIth Report, p. 508. It is 2 miles N.W. from Table Mountain, and west of Tuttletown. It is a large vein consisting of quartz in ankerite, with mariposite. The development is superficial. R. Chute, of San Francisco, owner.

Old Tuolumne Mine (Quartz).—See our XIIth Report, p. 305. It is on the South Fork of Stanislaus River, 4 miles N. of Columbia. Idle. Levy Bros., of San Francisco, owners.

Ophir Mine (Quartz).—See our XIIth Report, p. 305. It is 1 mile N. of Big Oak Flat. Idle. James Bros., of Groveland, owners.

Orcutt Mine (Quartz).—See Mammoth.

Pacific Mine (Quartz).—It is ½ mile W. of Quartz Mountain. It has a shaft 45′ deep, and a few surface cuts in amphibolite-schist. Idle. O. S. Cressy, of Stent, owner.

Page (*Simonich*) *Mine* (Quartz).—See our XIIth Report, p. 305. It is 1 mile N.E. of Sonora, and has been worked extensively and successfully for pockets. Six men are employed. Mrs. Pedro, of Sonora, owner.

Palo Alto Mine (Quartz).—It is on the South Fork of Stanislaus River, and has a 2′ vein. J. Donovan, owner.

Parole Mine (Quartz).—It is 3 miles N. of Soulsbyville. The vein is 1′ to 2′ wide in granite. A 150′ inclined shaft has been sunk and a steam hoist erected. Idle. W. H. Barron, of Soulsbyville, owner.

Patterson Mine (Quartz).—See our VIIIth and Xth Reports, pp. 56 and 656. It is ½ mile W. of Tuttletown, and has been worked to a depth of 70′, but is now idle. Joseph Podesto, of Tuttletown, owner.

Peña Blanco Mines (Quartz).—They are 1½ miles W. of the Rawhide Mine, and consist of the *Peña Blanco*, *Doctor*, *Lookout*, *Lucky Star*, and *Sarah Francis*. The Peña Blanco is the principal claim, and is the only one having any development. The quartz croppings are massive, covering the summit of the hill for a width of nearly 150′. A fault has displaced the vein near the surface, which, with large bowlders of quartz detached from the main mass, lie scattered about, partly imbedded in the soil, tending to give the impression, on casual inspection, of a vein of enormous width. As a matter of fact, however, the vein is exposed 30′ in width, and appears to be separated from a second vein lying back in the foot-wall, the width of which is unknown, though apparently large. The separating material consists of clay and slaty rock, with much quartz in small veins. A cross-cut tunnel has been driven 135′ in the hanging-wall, but has not yet reached the vein. At a point south of the cut, a second cross-cut tunnel has been run 200′, which has penetrated the vein here 5′ wide, consisting of bluish, banded quartz. A 5-stamp mill has been erected and a quantity of rock crushed. Idle. Dr. J. L. Ross et al., of Redwood City, San Mateo County, owners.

Pennsylvania Mine (Quartz).—See our XIth Report, p. 500. It is ½ mile N. of Carters, near the Laura and North Star Mine. It has two 50′ shafts. The vein is in granite. Fred Sutton, of Sonora, owner.

Pennsylvania Mine (Quartz).—See Soulsby. It is at Soulsbyville, and has a 300′ shaft.

Philadelphia Diggings (Hydraulic).—See our XIIth Report, p. 305. They are 10 miles N.E. of Columbia. Idle. W. H. Sharp, of San Francisco, owner.

Philadelphia and Rhode Island (*Martin*) *Mines* (Quartz).—They are on the East Lode, 2 miles S. of Carters, on the east side of the North Fork of Tuolumne River, at about 3,500′ elevation. They are a relocation of the old *Martin* Mine, and are 600′ by 2,335′ in extent. The vein is said to be 10″ to 30″ wide, in bluish-gray slate containing quite a percentage of pyrites. They are exploited by three tunnels on the vein, 60′, 450′, and 320′ in length respectively. Some stoping was done in the 60's, and the ore reduced in arrastras. Active operations were resumed this year. Goldwin Mining Co., of No. 63 Wall Street, N. Y., owner; W. H. McClintock, of Sonora, superintendent.

Pine Log Mine (Quartz).—It is 3 miles N. of Columbia, in the cañon of the Stanislaus River, and is a new location. The vein occurs in crystalline limestone, and has formed in a fissure between two sheets of dike rock. The quartz is rich, and shows considerable gold. One man is at work. August Wiedekind, of Columbia, owner.

Pine Ridge Mine (Quartz).—It is 2 miles W. of Jamestown. It has a shaft 100′ deep, on a vein 16″ to 4′ wide. Idle. E. A. Stent, of Stent, owner.

Pi-Ute Mine (Quartz).—It is a prospect on the North Fork of Tuolumne River, 4 miles N.E. of Carters. C. F. Haslam, of Sonora, owner.

Platt & Gilson Mine (Quartz).—See our VIIIth and Xth Reports, pp. 666 and 746. See Soulsby.

Plowboy Mine (Quartz).—See Confidence.

Pride of Tuolumne Mine (Quartz).—It is a prospect, 1 mile W. of Tuttletown. Mrs. Rikert, of Sonora, owner.

Prudhome Mine (Quartz).—It is at Arrastraville. The vein is 1′ to 2′ wide, in black slate. Frank Prudhome, of Sonora, owner.

Puerto-Fino Mine (Quartz).—See our XIIth Report, p. 499. It is ½ mile N.W. of Carters, in granite. Idle. William Sharwood, of Soulsbyville, owner.

Raggio Mine (Quartz).—See Nonpareil.

Rappahannock Mine (Quartz).—It is at Rawhide, and ½ mile N. of Table Mountain. Since our XIIth Report was issued a new shaft has been sunk 400′, and a drift and cross-cut started at that level for the purpose of finding the pay-shoot. The shaft has been sunk entirely in serpentine, which lies along the west side of the vein. Northward from the shaft, quartz and amphibolite-schist are found, and at one point a heavy gouge, evidently the main fissure, but no work has been done at that point. In cross-cutting and drifting some very rich quartz has been encountered. It is supplied with a good hoisting plant. Fourteen men are employed. R. Chute, of Jamestown, owner and superintendent.

Rawhide Mine (Quartz).—See our Xth, XIth, and XIIth Reports, pp. 54, 507, and 306. It is the second claim on the gold belt N. of Table Mountain. The shaft commenced in 1891 is said to be 1,000′ deep. Admission to the mine was refused, and only hearsay information obtainable. Since the XIIth Report, a chlorination plant, with a single 5-ton furnace, was built in 1895, and a second similar furnace constructed in 1896. One hundred men are employed. W. H. Martin & Co. et al., 205 Crocker Building, San Francisco, owners; W. A. Nevills, of Jamestown, superintendent.

Rawhide No. 2 Mine (Quartz).—It is the first claim S. of the Rawhide. Idle. A. Hayward et al., of San Francisco, owners.

Red Jacket Mine (Quartz).—It is near Big Oak Flat. The vein is from 1′ to 4′ wide. Louis Rapetto, of Big Oak Flat, owner.

Republican Mine (Quartz).—See our Xth Report, p. 47. It is at Jacksonville. It has been exploited for pockets. It has a 5-stamp mill. W. Lemmon, of Jacksonville, owner.

Rhode Island Mine (Quartz).—See Philadelphia.

Richards (*Summers*) *Mine* (Quartz).—It is ½ mile S.E. of Carters, and is opened by tunnels, 150′ and 200′ long, respectively. Idle. W. S. Chapman, of San Francisco, owner.

Rikert Homestake Mine (Quartz).—It is a prospect on Daniels Flat, 1½ miles W. of Tuttletown. Edwin Rikert, of Tuttletown, owner.

Rising Sun (*Sonora Extension*) *Mine* (Quartz).—See our Xth and XIth Reports, pp. 748 and 502. It is on Turnback Creek, 9 miles E. of Sonora. A large amount of work has been done on this mine. The vein is said to be 1′ wide, and high-grade. Idle. Sonora Extension Mining Co., of Sonora, owner; J. H. Neale, of Sonora, superintendent.

Ritchie Mine (Quartz).—It is ½ mile W. of Tuttletown. It is a pocket mine, in diabase, and has several hundred feet of tunnels, upraises, etc.

The quartz is crushed in a water-power arrastra, located a short distance from the mouth of the lowest tunnel. W. E. Nevills, of Tuttletown, owner.

Riverside Mine (Quartz). It is 11 miles N. of Soulsbyville, on the South Fork of Stanislaus River. It was worked years ago through tunnels, but has long been idle. Williams Bros., of San José, owners.

Ross Mine (Quartz).—It is a prospect, 1½ miles S.W. of Tuttletown. Mrs. Rikert, of Sonora, owner.

Royal Granite Mine (Quartz).—It is a new location, 1¼ miles S. of Priests. An incline has been sunk 40′ on an 18″ vein, in diorite. Besides some visible gold the quartz contains coarsely crystallized sulphides of iron and copper. Two men are employed. Price & Lumsen, of Big Oak Flat, owners.

Sailor Boy Mine (Quartz).—It is on the Stanislaus River, 13 miles N. of Columbia. It has been opened by several tunnels, 50′ to 300′ in length. The quartz is dark blue and glassy in appearance, and shows gold occasionally. One man is employed. John Canyon, of Murphy, owner.

San Guiseppe Mine (Quartz).—See our VIIIth, Xth, and XIIth Reports, pp. 654, 740, and 306. It is ½ mile W. of Sonora. The vein occurs in amphibolite-schist altered from diorite-porphyrite. The quartz contains no free gold, it being wholly associated with iron sulphide and tellurium. The shaft is 215′ deep, and sinking is in progress. Seven men are employed. Fred Sutton, of Sonora, owner.

Santa Maria Mine (Quartz).—It is near Crockers, 20 miles S.E. of Groveland. The vein is from 6″ to 8′ wide, and is heavily sulphuretted. The formation is granite. The development consists of a cross-cut tunnel and drifts along the vein. Two men are employed. John H. Neale et al., of Sonora, owners.

Santa Ysabel Mines (Quartz).—This property is on the south end of Quartz Mountain, at 1,500′ elevation, and comprises the claims formerly known as the *Gray Eagle*, *Knox & Boyle*, *Miller & Holmes*, and *Nyman*. See our Xth and XIIth Reports, pp. 51 and 304. There is considerable development on the property, which was made years ago. More recently three new shafts have been sunk; No. 1, the most southerly, is 250′ deep; No. 2, on the Miller & Holmes, is 360′ deep, and No. 3, on the Knox & Boyle, is sunk 600′ from a station cut in an adit level driven from the south side of the hill. There are extensive cross-cuts and drifts run from each of these shafts. A drift south from No. 3 shaft will connect with the other shafts at the 300′ level. An electric plant was installed in the summer of 1895, the dynamo being placed on Woods Creek, and the power transmitted to the several hoists. It having been demonstrated that the water-supply is not to be depended upon, an auxiliary steam-plant has been installed, with another generator at the mines. The electric motors have given entire satisfaction thus far. Sixty-two men are employed. Santa Ysabel Mining Co., of Boston, Mass., owner; B. M. Newcomb, of Stent, superintendent.

Sarah Francis Mine (Quartz).—See Peña Blanco.

Saratoga Mine (Quartz).—See our XIIth Report, p. 306. Worked for pockets. Six men are employed. J. T. Faxon, of Sonora, owner.

Sell Mine (Quartz).—It is a pocket mine, on the west slope of Bald Mountain, ½ mile N.E. of Sonora. Four men are employed. John Bachich, of Sonora, owner.

Seminole Mine (Quartz).—This property is 1 mile S. of Carters, and comprises the *Buckeye*, *Georgia*, *Mayflower*, *Lena Belle*, *Seminole*, and *Young America* claims, which are located on a vein or lode having a northeasterly strike, and presumably joining the Consolidated Eureka vein near the Lady Washington Mine. The Seminole is the principal claim, and is opened by an incline 200′ deep, connecting with an adit cross-cut at 100′ from the surface. Levels have been run on the vein, and some stoping done. The quartz is crushed in a 10-stamp mill. Other than the Mayflower the remaining claims have only superficial development. Eighteen men are employed. Consolidated Seminole Mining Co., of New York, owner; J. L. Coles, of Carters, superintendent.

Shanghai Mine (Quartz).—It is on Yankee Hill, 3½ miles E. of Columbia. The only information obtainable is that in early days a shaft was sunk to an unknown depth. It is now being reopened and a substantial hoisting plant erected. Five men are employed. P. Morgan, of Columbia, owner.

Shawmut Mine (Quartz).—See Eagle. It is 2½ miles N.W. of Jacksonville. A cross-cut has been driven on the Shawmut, 1,125′ from Woods Creek, crossing the vein, the face still being in ankerite. Drifting south is now in progress. Twenty-one men are employed. Rosenfield & Halsey, owners; A. Halsey, of Chinese Camp, superintendent.

Silken Mine (Quartz).—See our XIIth Report, p. 306. It is 1 mile N.E. of Priests Hill. Idle. C. P. Hale, of Big Oak Flat, owner.

Silver Star Mine (Quartz).—It is a new claim, lying east of the Mammoth, ¾ mile N.E. of Jacksonville. It has only superficial development. J. M. Russell, of Jacksonville, owner.

Silver Star Mine (Quartz).—It is a prospect on Big Oak Flat, and is opened by a tunnel 65′ in length. H. Yerkin, of Big Oak Flat, owner.

Skinner Mine (Quartz).—It is a prospect, 1 mile S.E. of Jacksonville. Harriman & Oliver, of Sonora, owners.

Silver Queen Mine (Quartz).—It is on Yankee Hill, 3½ miles E. of Columbia. The vein is 3′ wide. George Mapes, of Sonora, owner.

Snell Mine (Quartz).—See our XIth Report, p. 505. It is between Rose Creek and the Stanislaus River, 7 miles E. of Murphy, and 13 miles N. of Columbia. There are two veins or pay-shoots, which overlap at the ends, and are about 10′ apart. They are joined diagonally by a cross vein. There are two shafts, 100′ and 75′ deep, respectively, which are connected underground by a drift and raise. The veins are from 1′ to 8′ wide. A winze is sunk below the 100′ level, but the air in the mine was so bad that no examination could safely be made. Formerly quartz was hauled a long distance from the mine to an arrastra and crushed, but lately the rock extracted has been piled on the dump, and a large quantity has accumulated. There are only trails in these mountains at present, which is a drawback to the more rapid development of the section. Two men are employed. Estate of Col. Dorsey, of San Francisco, owner.

Sonorita Mine (Quartz).—It is near Arrastraville. The vein is 20″ wide. It has a 10-stamp water-power mill. Sonora Extension Mining Co., of Sonora, owner.

Sonora Extension Mine (Quartz).—See Rising Sun.

Soulsby Mines (Quartz).—See our VIth (Part II), Xth, and XIIth Reports, pp. 59, 742, and 306. They are at Soulsbyville, and comprise the *Churchill*, *Johnson & Bradbury*, *Pennsylvania*, *Platt & Gilson*, and

Soulsby mines. The formation is grano-diorite, mica-schist, and intrusive dikes of diorite and felsitic rock. The principal mine is the Soulsby, which has been worked 800′ in depth. The quartz usually carries quite a large percentage of sulphides of iron, copper, lead, and zinc, containing gold. Pyrrhotite is also of common occurrence. The vein, about 2′ wide, is high-grade. It has been idle some years, but was recently sold, and the purchasers have already made important discoveries on reopening and sinking in the old Pennsylvania shaft, and a new hoist is being erected. Twelve men are employed. William Sharwood, of Soulsbyville, superintendent.

Spring Gulch Mine (Quartz).—It is between Big Cañon and the North Fork of Tuolumne River, 2½ miles S.E. of Carters. It has a shaft reported to be 400′ deep. The workings are now caved. It was at one time equipped with a hoisting plant and 10-stamp mill, both of which burned. W. Marshall, of Sonora, owner.

Stanley Mine (Quartz).—See our XIth Report, p. 510. It is on Kanaka Creek, 1 mile S.E. of Jacksonville. It has a tunnel and open cut. The gold-bearing zone is in amphibolite-schist. There is a 10-stamp mill on the mine. Idle. Thomas Whitto, of Sonora, owner.

Star Mine (Quartz).—It is 18 miles N.E. of Sonora, near Rose Creek, and is an old mine being reopened. The main shaft is 170′ deep. There is in the aggregate 1,400′ of shafts, tunnels, raises, etc., on the mine. The vein is in slate, a few hundred feet from a large granite mass. A new 10-stamp mill is being built. The quartz is usually heavily sulphuretted, carrying sulphides of iron, lead, zinc, and copper, and often visible gold. The mill will be equipped with both steam and water power. For the latter a pressure of 510′ is available. The property is situated in a heavy belt of timber. Seventeen men are employed. Rose Creek Milling Co., of San Francisco, owner; F. W. Wilmans, of Columbia, superintendent.

Stenchfield Mine (Quartz).—See Karrington.

Stewart Mine (Quartz).—It is ½ mile E. of Sonora, and is worked for pockets. Three men are employed. Mr. Stewart et al., of Sonora, owners.

Stockton Mine (Quartz).—It is ½ mile S. of Sonora, and is a pocket mine that has been worked extensively. It has recently been equipped with a new hoisting and pumping plant, and an incline sunk 200′ on the vein. Three men are employed. R. B. Lane and W. C. Oaks, of Sonora, owners.

Street Mine (Quartz).—It is ½ mile N. of Tuttletown, near Jackson Flat, and has been opened by several shallow shafts. It has a 6-stamp mill. Four men were employed in August, 1896. Fred Sutton, of Sonora, owner.

Sugarman (*Sophia*) *Mine* (Quartz).—See our Xth Report, p. 737. It is 1 mile N.E. of Sonora, on Bald Mountain. It is a pocket mine, producing crystallized gold of great beauty. Two men are employed. John Neale, of Sonora, owner.

Sullivan Mine (Quartz).—It is 4 miles N. of Groveland, joining the Godfrey Mine. A shaft has been sunk 30′ on the vein. Two men are employed. Sullivan Bros., of Groveland, owners.

Sweeney Mine (Quartz).—It is ¼ mile N. of Quartz Mountain, and has a shaft 200′ deep, but no machinery. Howard Preston, of Jamestown, owner.

Swerer Mine (Quartz).—It is at Tuttletown, and is worked for pockets. A cross-cut tunnel is being driven to connect with the old workings, and will be 250′ in length. Three men are employed. Mrs. William Swerer, of Tuttletown, owner.

Tanzy Mine (Quartz).—It is on the Bonanza vein, in Sonora. Three men are employed. Cuneo & Oneto, of Sonora, owners.

Tarantula Mine (Quartz).—It is 1 mile S.W. of Tuttletown and 2 miles N. of Table Mountain. It has a 4′x 10′ shaft, which is 80′ deep. Idle. E. C. Frisbee, of Sonora, owner.

Thompson Mine (Quartz).—It is a pocket mine, ½ mile S. of Big Oak Flat. The formation is mica-schist, intruded by diorite dikes. Two men are employed. Hall & Harten, of Big Oak Flat, lessees.

Toledo Mine (Quartz).—It is 1½ miles W. of Tuttletown, and was at one time worked successfully. The quartz contains mispickel. More recently a hoist was erected and a shaft sunk 100′, but the machinery was too light to sink deeper and hoist the water, and the mine is idle again. W. B. Clements, of Tuttletown, owner.

Trio Mine (Quartz).—See our Xth Report, p. 53. It is 1¼ miles N.W. of Jamestown. It has a massive cropping of quartz and ankerite. A tunnel has been driven obliquely in this mass, cross-cutting a vein 35′ wide. A. Hayward, of San Francisco, owner.

Urquhardt Mines (Quartz).—This group is 6 miles N.E. of Groveland, and consists of thirteen claims, of which the Mexican is the only one having any development. A 50′ shaft has been sunk on a 4′ vein. The remaining claims have only surface cuts. Joseph Urquhardt, of Groveland, owner.

Utopia Mine (Quartz).—It is a prospect, 1¼ miles S.W. of Tuttletown. Mrs. Rikert, of Sonora, owner.

Valparaiso Mine (Quartz).—It is 1 mile N. of Tuttletown, near the Stanislaus River. It was worked years ago, and then abandoned. A new tunnel is now being driven into the mountain which will be 759′ from the surface when under the old workings. Six men are employed. William Krouse, of Tuttletown, owner.

Violet Mine (Quartz).—It is on the North Fork of Tuolumne River. The vein is 2′ to 3′ wide. Neale & Carter, of Sonora, owners.

Virginia Mine (Quartz).—See Argall.

Virginia Mine (Quartz).—See Garfield-Virginia.

Vulture (Donovan) Mine (Quartz).—It is 1 mile N. of Quartz Mountain. A cross-cut tunnel 100′ long cuts through a vein of quartz and ankerite 25′ wide. Idle. Mrs. Donovan et al., of Jamestown, owners.

Waterman Mines (Quartz).—They are 2 miles N.W. of Big Oak Flat, and are pocket mines which have quite extensive superficial development. Two men are employed. A. Waterman, of Groveland, owner.

Watson Mine (Quartz).—It is on the Watson ranch, 5 miles N.E. of Groveland, and has a 40′ shaft on a 4′ vein of quartz. Two men are employed. Edward Watson, of Groveland, owner.

Wheal Perrin Mine (Quartz).—It is at Soulsbyville, joining the Soulsby Mine. It has a shaft 80′ deep. William Glasson, of Sonora, owner.

Wheal Ruff Mine (Quartz).—It is ½ mile W. of Soulsbyville, on the Mono road. It has a shaft 110′ deep on a vein 1½′ wide, which carries a high-grade sulphuretted ore. Thomas Richards, of Sonora, owner.

Wheeler Mine (Quartz).—It is a pocket mine, ½ mile N.E. of Big Oak Flat. O. Fisk, of Coulterville, Mariposa County, owner.

White Oak Mine (Quartz).—See Black Oak.

Whitto (*Draper*) *Mine* (Quartz).—It is 1 mile W. of Soulsbyville, in granite. It has a 300′ inclined shaft, now caved. Thomas Whitto, of Sonora, owner.

Wildcat Mine (Quartz).—It is at Big Oak Flat. A tunnel has been driven 100′ on the vein. Harper & Harten, of Groveland, owners.

Willietta Mine (Quartz).—See our Xth Report, p. 47. It is 1 mile S.E. of Jacksonville. Owned in Scotland; William Sharwood, of Soulsbyville, agent.

Winchester Mine (Drift).—It is in the northern outskirts of Columbia. Idle. Miss Julia Winchester, of Columbia, owner.

Winnie (*Harris*, *Dorsey*) *Mine* (Quartz).—It is 1¾ miles N.W. of Quartz Mountain, and is a portion of the Crystalline property. It has a massive outcrop, in which a large shaft is being sunk. Four men are employed. Rapp & Shafer, of San Francisco, owners.

Wooten Mine (Quartz).—It is on the north side of Big Oak Flat, joining the Mack Mine on the south. It was formerly operated through a shaft now caved. D. F. Longfellow, of Big Oak Flat, owner.

Worcester Mine (Quartz).—It is ½ mile N. of Tuttletown, and is a pocket mine, in amphibolite-schist. It is opened by a series of shafts from 15′ to 55′ in depth, besides surface cuts, underground drifts, etc. One man is employed. H. O. Gibson, of Tuttletown, owner.

Worcester Mine (Quartz).—It is 1½ miles S.W. of Carters, and is between the *Buckeye* and *Georgia* claims, of the *Seminole* group. There is a 90′ shaft and a steam hoist on the mine, but no mill. Idle. T. G. Winwood, of Sonora, owner.

Yancy Mine (Quartz).—It is a pocket mine, 1 mile N.E. of Sonora. Two men are employed. Mr. Yancy, of Sonora, owner.

Young America Mine (Quartz).—See Seminole Group.

MILLS IN TUOLUMNE COUNTY.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of Each, in Lbs.	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size
					No.	Character.	No.	Capacity.		
App & Heslep	Water	40	850							
Basin	Steam	5								
Belleview	Steam	10	850	20	4					400 sq. ft.
Black Oak	S. & W.	10	850	20	4					
Bonanza	Water	2	850	5						
Buchanan	Steam	10	850							
Buzzard's Roost	Water	5								
Clio		10	750							
Con. Eureka (Dead Horse)	S. & W.	20	750	40	8	Frue				
Conlin & Graham	Steam	4	700							
Dutch	Steam	5	850	10						No data.
Experimental Gulch	Water	10	650	25						
Fischer	Water	5	750							
Gem	Water	10	650	10						
Golden Gate	Water	20	850	50	8	Frue	1	2 tons.		3,200 sq. ft.
Golden Rule	Water	10	800	12						
Hammilfield	Water	10	900	23						No data.
Joe Hooker	Water	5								
Jumper	Water	10	950	20						
Kanaka	Water	10	750	20						
Keltz	Water	15	850	30	3	Woodbury				
Knox & Boyle		10	(Will build	larger	mill)					
Laura and North Star	Water	10	850							
Little Gem	Water	10	850	30						
Mammoth	Water	10								
Madrid	Water	5	650	7½						
Mississippi	Steam	10	750							
Mount Zion	Water	5	750							
New Albany	Water	10								
Noonday		5								
Ohio	Steam	5	700							
Patterson		10	(Falling	down)						
Peña Blanco	Steam	5	850	12						
Rawhide*	Elect.	40	850	70	16	Frue	1	5 tons.		
Republican	Water	5	750							

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*Only 20 stamps running.

MILLS IN TUOLUMNE COUNTY—Continued.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of Each, in Lbs.	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
					No.	Character.	No.	Capacity.		
Riverside		20	750							
Seeber	Water	15	750	40						
Seminole	Water	10	850							
Sonorita	Water	10								
Soulsby	Water	15	750							
Stanley	Water	10	850							
Star	S. & W.	10	900	20	4	U. I. Works				
Street	Steam	6	700							
Willietta (mill dismantled)										

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN TUOLUMNE COUNTY.

Name of Mill or Mine.	Power.	Number	Character.	Diameter	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
						No.	Character.	No.	Capacity.		
Gloster			Arrastra								
Ritchie	Water		Arrastra		1						

Ventura County.

Bunker Hill Mine (Quartz).—See our XIIth Report, p. 314. It is on the western slope of Frazer Mountain, 15 miles W. of Gorman, at about 6,000′ altitude. Idle until recently. Three men are employed. Haylock Bros., of Ventura, owners.

Castac Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 683 and 315. It is on Piru River, in the Snowy District, about 10 miles S. of Gorman. The mill was burned in May, 1895. Idle. A. Frazier, of Gorman, owner.

Fairview Mine (Quartz).—See our XIIth Report, p. 315. It is on the west side of Frazer Mountain, and adjoins the Bunker Hill. Idle. Haylock & Read, of Gorman, owners.

Foley (Esperanza) Mine (Quartz).—It is on the western part of Frazer Mountain, 18 miles W. of Gorman, at 6,200′ altitude. The developments consist of shallow cuts and two shafts, 20′ and 40′ deep. Three men are employed. John Foley, of Gorman, owner.

Frazer Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 682 and 315. It is on the southern slope of Frazer Mountain, 6 miles W. of Gorman, at about 7,000′ altitude. The workings consist of 2,200′ of tunneling, and since our last Report more systematic mining has been carried on. The old mill, burned in August, 1894, has been replaced by a 10-stamp mill and a $3\frac{1}{2}'$ Huntington mill. Pine timber is abundant. There is only enough water to run the mill half-time during summer. The ore is said to average 8% sulphurets, which are worked by the cyanide process. Eighteen men are employed. Frazer Mining Co., owner; J. D. Bicknell, of Los Angeles, president; G. F. Conant, of Los Angeles, secretary; W. W. James, of Gorman, superintendent.

White Mule Mine (Quartz).—See our VIIIth and XIIth Reports, pp. 682 and 316. It is near the Fairview, on the western part of Frazer Mountain, at 6,500′ altitude. Idle.

There are numerous other idle claims in the Frazer Mountain District, on which more or less development has been done.

MILLS IN VENTURA COUNTY.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of Each, in Lbs.	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
					No.	Character.	No.	Capacity.		
Frazer*	Steam	10	850	33	2	Gilt Edge			25 tons.	

In addition to stamps, the mill marked with a * have additional crushing capacity, as noted in the following list:

ARRASTRAS, PATENT MILLS, DRY-WASHERS, ETC., IN VENTURA COUNTY.

Name of Mill or Mine.	Power.	Number	Character.	Diameter	Capacity per 24 Hrs., in Tons.	Concentrators.		Furnaces.		Cyanide Plant, Daily Capacity.	Canvas Table, Size.
						No.	Character.	No.	Capacity.		
Foley			Arrastra								
Frazer		1	Huntington	3½′							

Yuba County.

The important industries of the valley region of the county are agriculture, horticulture, and stock-raising. Hops are extensively grown about Wheatland. The sugar-beet industry is contemplated, and it is said a sugar factory will soon be erected. The lands are well watered, both by stream and subterranean supply. The soils of the lowlands are deep and fertile. Bricks are burned intermittently near Marysville and Wheatland, from superficial deposits of sandy clay, to supply local demands. Natural gas escapes from water wells at Marysville, but is not used.

Beehive Mine (Quartz).—See Mount Hope.

Boa Mine (Quartz).—It is situated in Timbuctoo, at 650′ elevation, and consists of three claims consolidated. The vein is 3½′ wide in the bottom of the workings, courses N.W., and dips 53° W., in slate. It is being developed through two shafts; one is 66′ in depth and the other, a new 4′x 6′ shaft, is now 41′ deep. The quartz carries 2% of sulphurets; no plant on the mine. Four men are employed. An incorporated company, owner; R. H. Dailey, of No. 216 Post Street, San Francisco, secretary; G. E. Mowath, of Smartsville, superintendent.

Blue Point Mine (Placer).—See our XIIth Report, p. 317. It is ¼ mile E. from Smartsville, at about 550′ elevation. Idle. P. Campbell, of Smartsville, owner.

Brandy Creek Mine (Placer).—See our XIIth Report, p. 318. It is 2½ miles N.W. of Camptonville, and comprises 6,500′ by 600′. — Stevens et al., of Camptonville, owners.

Burns Mine (Quartz).—It is ¾ mile N.E. of Smartsville, at 500′ elevation. The 3′ vein trends N.W., and dips N.E., between slate walls. It is opened by shaft and tunnel. The former is 50′ deep on the pitch of the vein, while the tunnel is 200′ in length. Assessment work only. J. Burns, of Smartsville, owner.

Chandler Mine (Quartz).—See our XIIth Report, p. 318. It is situated 2 miles S. of Brown's Valley P. O., and contains 160 acres of patented land. Idle. J. Lafferty, of Brown's Valley, owner.

Cleopatra Mine (Quartz).—It is ½ mile N.E. from Smartsville, at 600′ elevation. The 2½′ vein trends N.W. and S.E., and dips S.W. A 22′ incline has been sunk on the vein. Assessment work only. Excelsior Water and Mining Co., of Smartsville, owner; Mr. Hallsted, of Smartsville, manager.

Dakota Mine (Quartz).—See our XIIth Report, p. 318. It is 1½ miles N.W. from Brownsville, at 2,600′ elevation. J. C. Campbell and T. A. Hawley, of Brownsville, owners.

Dannebrog Mine (Quartz).—See our Xth and XIIth Reports, pp. 798 and 318. It is situated on the outskirts of the town of Brown's Valley, at 250′ elevation. Since our last Report the mine has passed under the control of parties who have placed a boiler and No. 10 Hooker pump at the shaft, and are pumping out the mine to resume active work. The former workings extended to a depth of 600′. N. D. Rideout et al., of Marysville, owners; J. C. Campbell, of Brown's Valley, superintendent.

Deadwood Mine (Quartz).—It is 2½ miles from Forbestown, near the Butte County line, at 2,660′ elevation. The vein, 5′ to 9′ wide, strikes N.E., and dips S.E., in a greenstone formation. The quartz is well mineralized. Several shallow shafts have been sunk, but the mine is idle. Mrs. Miller, of Forbestown, owner.

Delaware Mine (Quartz).—See our XIIth Report, p. 318. It is 6 miles S.E. of Brownsville, and is an extension of the Eagle Mine. Enoch Bros., of Dobbins Ranch, owners.

Eagle Gold Mine (Quartz).—See our XIIth Report, p. 318. It is 6 miles S.E. from Brownsville; near the Indiana Ranch. Idle. L. Wilder and J. Rodgers, of Dobbins Ranch, owners.

Excelsior Water and Mining Co.'s Mine (Hydraulic).—See our XIIth Report, p. 319. Its mining ground lies about ¼ mile E. of Smartsville, and extends to Mooney's Flat, at 550′ elevation. Not working; the company rents water for mining and irrigating. Dr. Ayer's heirs, of Boston, Mass., owners; Mr. Hallsted, of Smartsville, superintendent.

Flag Mine (Quartz).—See Old Flag.

Golden Gate Mine (Quartz).—See our XIIth Report, p. 319. It is 1 mile S. of Woodville, near the Butte County line, at 3,475′ elevation, and comprises one claim of 1,500′ by 600′. The vein strikes N.E. and S.W., in granite, but has not been reached by the three cross-cuts, of which the longest is 80′. One man is at work. S. Thurston and A. L. Murphy, of Forbestown, owners.

Golden Mary Mine (Quartz).—See our XIIth Report, p. 319. It is situated 1 mile S.W. of Brownsville, in Sec. 34, T. 19 N., R. 6 E. H. L. Clark and T. Cobain, of Brownsville, owners.

Good Hope Mine (Quartz).—See our Xth Report, p. 320. It is ¾ mile from Cabbage Patch, 10 miles E. of Wheatland. The mine and 4-stamp steam mill are idle. R. Vincent et al., of Grass Valley, Nevada County, owners.

Good Title (*Templar*) *Mine* (Quartz).—See our XIIth Report, p. 322. It is situated 14 miles S.W. from Camptonville, at 2,300′ elevation. The vein, varying from 16″ to 13′ in width, trends N.W. and S.E., and dips 40° N.E. between syenite walls. The quartz carries 1% sulphurets of high grade. The mine has been idle for some time, but is being reopened with a lower tunnel, as the water drove them out of the former workings, which consisted of a 250′ cross-cut tunnel to the vein, with 400′ of drifts thereon, and a shallow winze. There is a 4-stamp steam-power mill, with two Frue concentrators. Four men are at work. J. J. Dailey, of Dobbins Creek P.O., owner.

Hawkeye Mine (Quartz).—It is situated in the town of Brown's Valley, at 250′ elevation. The 1,500′ by 600′ claim contains a vein, 18″ to 24″ wide, trending N.E. and S.W., and dipping 35° S.E., with a greenstone foot-wall. Besides free gold, the quartz carries some sulphurets. The vein has been worked along the outcrop by open cuts, and the richest of the ore crushed in the hand-mortar. Two men are at work. Barton Bros., of Brown's Valley, owners.

Hibbert & Burris Mine (Quartz).—See our Xth and XIIth Reports, pp. 798 and 320. It is in Sec. 16, T. 16 N., R. 5 E., ¼ mile N.W. of Brown's Valley, at 250′ elevation. Idle. Hibbert & Burris, of Brown's Valley, owners.

Higgins Mine (Quartz).—It is 14 miles S.W. from Camptonville, at 2,300′ elevation. The vein, from 1′ to 9′ in width, carries ½% sulphurets, trends N.E., and dips nearly vertically, in a syenitic formation. The developments consist of an open cut and considerable stripping of the apex of the vein. A 5-stamp water-power mill is in course of erection; 400 inches of water are to be taken from Indiana Creek through 1 mile of 3'x 3' ditch. Eight men are at work. J. Rogers et al., of Dobbins Ranch P. O., owners.

Honeycomb Mine (Quartz).—See our XIIth Report, p. 321. It is on Willow Creek, 1½ miles W. of Camptonville. M. Malloch, of Marysville, secretary.

Jefferson Mine (Quartz).—See our XIIth Report, p. 321. It is situated in the south end of the town of Brown's Valley, at 250' elevation. Idle. An incorporated company, owner; G. Harvey, of Marysville, secretary.

Johnson Mine (Quartz).—See our XIIth Report, p. 321. It is 3 miles W. of Brownsville, in Sec. 28, T. 19 N., R. 6 E. H. A. Conwell, of Brownsville, owner.

Last Chance Mine (Quartz).—It is 3 miles N.E. of Spenceville, at 850' elevation, and produces gold and copper. Idle. D. O. Mills et al., of New York, owners.

Marc Anthony Mine (Quartz).—It is ¾ mile N.E. from Timbuctoo, at 650' elevation. The vein strikes N.W. in slate, and dips S.W. Only assessment work done. It has a 70' incline, tapped by a tunnel; also the remains of an old 10-stamp mill, driven by a 16' overshot waterwheel. An incorporated company, of Marysville, owner; M. Havy, of Smartsville, superintendent.

Mosquito Mine (Placer).—See our XIIth Report, p. 321. It is situated on the Indiana Ranch, 6 miles S.E. from Brownsville, at 2,400' approximate elevation, and consists of 80 acres. C. E. Morey, of Dobbins Ranch P. O., owners.

Mount Hope Mining and Milling Co.'s (*Beehive*) *Mine* (Quartz).—See our XIIth Report, p. 317. It is on the line between Butte and Yuba counties, 2 miles S. of Woodville, and comprises two claims. The former workings are being cleaned out, and a drain tunnel, now 180' long, is being run to tap the shaft, which is 175' deep. The 10-stamp steam-power mill, with 750-lb. stamps, is idle. Ten men are employed. Thomas Applegarth, of New York, secretary; George Roberts, of Forbestown, Butte County, superintendent.

New Era Gravel Mining Co.'s Mine (Placer).—This property is situated 1½ miles S.E. of Brown's Valley, at 200' approximate elevation, and comprises 240 acres along the Yuba River. The company has placed a dredger in the river for working the accumulated tailings and original gravel. The dredger is 65' long, 20½' beam, and is supplied with 27 buckets attached to a frame (ladder), which can be lowered to the bottom through a slot in the center of the bow of the boat. Seven bucket-loads is equivalent to one cubic yard. The loaded buckets are raised above the upper deck and dumped automatically on a grizzly placed above and in front of a carrier amidship, which travels toward, and dumps the rocks over, the stern. The material which passes through the grizzly drops into a chute leading to a line of sluices, 76' long, parallel with, but on a lower level than, the carrier. The sluices, lined with slat riffles, are supplied with quicksilver, and dump over the stern of the boat. One and a half cubic yards of material is raised per minute. The water for washing the gravel in the sluices is raised from the river through a well, placed amidship, by means of a centrifugal pump, geared to throw a steady stream of 75 miner's inches, but which can be increased to 160 miner's inches. The machinery is driven by an 80

H.P. engine, supplied with steam from a locomotive boiler. A safety clutch provides for stopping the dredging machinery instantly in case of accidents to the buckets. The entire machinery weighs 80,000 lbs. The boat has a draught of 27″. It requires 4 men to run the dredger. An incorporated company, owner; J. Toplitz, of No. 330 Pine Street, San Francisco, secretary; T. J. Hibbert, of Brown's Valley, superintendent.

Ohio Flat Mining Co.'s Mine (Hydraulic).—It is 2½ miles S.E. from Forbestown, at 2,500′ elevation, and comprises an agricultural patent. Five acres have been worked, and about four remain to be worked. The bank is from 16′ to 25′ high, with from 2′ to 3′ of gravel next to the granite bedrock. The Forbestown ditch supplies 180 miner's inches of water for the giant and elevator, which raises the debris 20′; thence, through 500′ of 2′x 3½′ flume, dumping onto Nevada Flat. Eight men are employed. Thomas Little et al., of Forbestown, owners.

Old Flag (*Flag*) *Mine* (Quartz).—It is ¾ mile N. of Brown's Valley P. O., at 280′ elevation, and consists of two locations, with two veins; the principal one varies from 10″ to 4′ in width, courses N.W., and dips 35° S.W., with an extremely hard greenstone foot-wall and well-defined gouge. The quartz is of ribbon structure, rather glassy, carries coarse, free gold and 1½% to 2% high-grade sulphurets, including lead, iron, zinc, and copper. A 5′x 10′ incline shaft has been sunk 200′ deep, where a station is being completed, prior to continuing the shaft to the 400′ level. At 150′ a drift has been run over 200′ N. and a short distance S. From the stopes over the N. drift, and which extend to the surface, the present supply of milling rock is being taken. The hoist is run by a 30 H.P. engine, and the 8″ Cornish plunger pump by a 40 H.P. engine; so far the mine does not make much water. The ore is being hauled ½ mile to the Hibbard & Burris 5-stamp mill, until the company's 10-stamp mill has been erected. This mill crushes 7½ tons per day, through a No. 60 screen, and saves the concentrates on a Union concentrator. Feeding and rock-breaking are done by hand. Twenty-two men are employed. An incorporated company, owner; F. L. Olmstead, of No. 315 Montgomery Street, San Francisco, secretary; A. H. Walrath, of Brown's Valley, superintendent.

Old Pittsburg Mine (Drift).—See our XIIth Report, p. 321. It is 7 miles N.W. of Camptonville, and comprises 18 acres on an old channel. F. W. Haley et al., of Camptonville, owners.

Rattlesnake Mine (Quartz).—See our XIIth Report, p. 322. It is 1 mile N. of Brown's Valley. Idle. Cabalier & Co., of Brown's Valley, owners.

R. C. Mine (Quartz).—See our XIIth Report, p. 322. It is ¼ mile E. of Brownsville. Reuben Clark, of Monticello, owner.

Slag Mine (Quartz).—See our XIIth Report, p. 322. It is ¾ mile N. of Brown's Valley. Thomas Gotman, of Brown's Valley, owner.

Sweet Vengeance Mine (Quartz).—See our XIIth Report, p. 322. It is 1½ miles N. of Brown's Valley.

Templar No. 3 Mine (Quartz).—See Good Title Mine.

York Mining Co.'s Mine (Hydraulic).—See our XIIth Report, p. 322. It is on New York House Flat, 1½ miles W. of Challenge. H. A. Conwell et al., of Brownsville, owners.

MILLS IN YUBA COUNTY.

Name of Mill or Mine.	Power.	Number of Stamps.	Weight of Each, in Lbs.	Capacity per 24 Hrs., in Tons.	Concentrators.	
					No.	Character.
Good Title	Steam	4	650		2	Frue.
Higgins	Water	5	750	6		
Marc Anthony		10				
Mount Hope	Steam	10	750			
Old Flag	Steam	5	850	7½	1	Union.

GYPSUM.

Fresno County.

Gypsum occurs in many places in the foothills skirting the west side of San Joaquin Valley, and has been mined intermittently, being used as a fertilizer for alkali soils. Only 600 tons, valued at $4,800, was mined in 1895.

Coalinga Mine.—See our XIIth Report and Bulletin No. 3, pp. 323 and 63. It is 9 miles N. of Coalinga, at about 1,500′ altitude. The mill is at Coalinga. Idle. Coalinga Gypsum and Fertilizing Co., of Visalia, owner.

Paoli Mine.—See our XIIth Report, p. 323. It is on the ridge bordering the San Joaquin Valley, 4 miles S. of Hayes, and Big Panoche Creek, at about 1,200′ altitude. Idle. Paoli Gypsum Mining Co., owner; J. H. Hall, of Selma, manager.

San Joaquin Valley Mine.—It is 4 miles N.W. of Coalinga, in Sec. 26, T. 21 S., R. 14 E., at about 1,000′ altitude. The gypsum occurs in disconnected bunches and of various grades, overlying the coal formation, and dips N.E. It is principally mixed with clay and sand. A limited quantity has been used as a fertilizer, and if properly selected more could be mined suitable for that purpose. San Joaquin Valley Coal Co., owner; E. Kauntz, of Hanford, superintendent.

Kings County.

E. D. Jones Mine.—It is in Kettlemen Valley, in the N.W. ¼ of Sec. 13, T. 24 S., R. 17 E., in the southwestern part of the county, at about 425′ altitude. It is worked intermittently. The gypsum is ground and used as a fertilizer. Samples have been selected which are said to be 94% pure, but the rock is generally poorer. The developments are two small open cuts. Impure gypsum outcrops in places over 80 acres. Two men are employed when the mine is being worked.

Los Angeles County.

Alpine Plaster Company.—See our XIIth Report, p. 324. The quarries are situated 1 mile S. of Palmdale. The works are at Alameda and Washington streets, Los Angeles. The products are wall-plaster, land-plaster, and plaster of Paris. Four men are employed in the quarry and five at the works in Los Angeles. S. W. Holsinger, of No. 317 E. Third Street, Los Angeles, superintendent.

San Benito County.

Bitterwater Deposit.—It is on a hill, on the west side of Bitterwater Valley, 12 miles N.E. of King City, at about 1,900′ altitude. It is a gray compact rock, 5′ thick, dips gently westward, is overlaid by soil, and outcrops in places over an area of about 500 acres. It is said to be suitable for land-plaster, and a limited quantity has been ground in San José and sold for that purpose. Idle. S. Lyons, of Bitterwater, and Dunn Bros., owners.

IRON.

Del Norte County.

Magnetite occurs in the serpentine near Gasquet, associated with copper and iron sulphurets.

Hematite is found in the northern part of the county in such quantity and quality to make it valuable for smelting. No developments. The mountains east of Gasquet, French Hill, and the slopes of Hardscrabble Creek are covered with grains and lumps of brightly polished black hematite, which seems to have weathered out of the serpentine country rock.

Humboldt County.

Centerville.—See our XIIth Report, p. 326, where this valuable deposit is described. Idle.

Napa County.

Iron is found at the head of Sulphur Creek, and also in Conn Valley, but is not utilized. See our XIIth Report, p. 327.

Shasta County.

Lost Confidence Mine.—See our XIIth Report, p. 327. It covers 40 acres, near Slick Rock Creek.

Maxwell Mine.—See our XIIth Report, p. 327. It is 1¾ miles E. of the McCloud River hatchery.

Potter Mine.—See our XIIth Report, p. 327. It is 1½ miles E. of the U. S. hatchery, on the McCloud River.

MAGNESITE.

Fresno County.

A 10′ ledge of hard white magnesite is said to exist on Kings River, 4 miles below Mill Creek, in Sec. 5, T. 13 S., R. 24 E.

Napa County.

Berthenia Mine.—See our XIIth Report, p. 328. This is in Soda Cañon, 12 miles E. of Rutherford. About 300 tons of rock was shipped from this mine in 1895, all in the natural state. It was taken from the croppings of the vein and from bowlders found on the surface. S. H. Delmater, of Chiles, owner.

Snowflake Mine.—See our XIIth Report, p. 328. It lies in Chiles Valley, 10 miles E. of Rutherford. There are four tunnels, from 80′ to 100′ long, driven in the vein, which is about 3½′ wide. To save freight charges the rock is calcined in an ordinary limekiln, and shipped in sacks to San Francisco. About 8 tons are treated per day. W. T. Bartlett, of St. Helena, owner.

Santa Clara County.

Magnesite occurs in numerous places in serpentine in the mountainous region of the eastern part of the county, the greater part of which is too far from shipping facilities to be of economic importance at present.

Cochran's, Mrs. A. F., Quarry.—It is on Coyote Creek, 4 miles E. of Madrone, at about 600′ elevation, and is worked intermittently. Pacific Rolling Mills, of San Francisco, lessee.

Red Mountain Deposits.—See our XIth and XIIth Reports, pp. 374 and 328. A number of outcrops of magnesite occur on the slopes of Red Mountain, in the northeastern part of the county, and a number of claims have been taken up. On account of the great distance from market they have been temporarily abandoned. There is a large outcrop in Sec. 18, T. 6 S., R. 5 E., on the south side of the mountain, at about 3,500′ elevation.

Tulare County.

A large deposit of magnesite is said to exist in T. 19 S., R. 35 E. Not developed.

MANGANESE.

Alameda County.

About 600 tons was produced in 1895 in this county, and is principally used in gold chlorination works. It occurs in bunch-like deposits in the southeastern part of the county, and in many places the shales are impregnated with it. It varies greatly in character, and requires careful assorting to obtain the proper grade of ore.

Bartlett Mine.—See our XIth and XIIth Reports, pp. 121 and 329. It is in Mitchell Cañon, in Sec. 6, T. 4 S., R. 4 E., 15 miles S.E. of Livermore. Idle. H. H. Pitcher, of Livermore, owner.

Estacio's, B. F., Mine.—See our XIIth Report, p. 329. It is on the Cedar Mountain road, 8 miles S.E. of Livermore. Idle.

Hearst's, J. W., Mine.—It is in Sec. 30, T. 4 S., R. 4 E. It is a new prospect, and is not sufficiently developed to determine the extent of the ore. Three men are employed in developing.

Mendenhall's, O. W., Mine.—See our XIIth Report, p. 329. It is ½ mile S. of Cedar Mountain road, and 11 miles S.E. of Livermore. Idle.

Mendenhall's, O. W., Corral Hollow Mine.—It is on the steep eastern slope of Corral Hollow, about 14 miles S.E. of Livermore. The ore occurs in jaspery shales, which dip 45° to 60° E. About 200 tons of good ore has been mined near the surface. Two men are employed. J. W. Merchant, of Livermore, lessee.

Merchant's, J. W., Mine.—See our XIIth Report, p. 329. It is on the Arroyo Mocha Valley road, in Sec. 21, T. 4 S., R. 3 E., 11 miles S.E. of Livermore. About 200 tons of good ore has been mined near the surface. Idle.

Overacker's, H. T., Mine.—It is a small prospect in the Arroyo Mocha Cañon, 12 miles S.E. of Livermore. Manganese impregnates the shales, and a limited quantity of good ore has been obtained. One man is employed.

Taylor & Pitcher's Mine.—See our XIIth Report, p. 329. It is on the east side of Corral Hollow, 15 miles S.E. of Livermore. About 300 tons of good ore is said to have been mined. Idle. Taylor & Pitcher, of Livermore, owners.

Del Norte County.

Psilomelane is reported to exist in the northern part of the county in a large body. Not visited.

Marin County.

A variety of manganese ores are found on the Mailliard ranch, 7½ miles W. of San Rafael. See our XIIth Report, p. 329.

San Joaquin County.

J. Caire's Mine.—See our Xth Report, p. 564. It is on the south side of Corral Hollow, 10 miles S.W. of Tracy, at 900′ altitude. The ore is in a vein-like deposit, in bunches, more or less connected, running N.W. in arenaceous shale and jasper. It is worked intermittently, and 280 tons were mined in 1895. The workings consist of a tunnel about 600′ long, and a number of stopes. J. Caire, of San Francisco, owner.

Santa Clara County.

DeForest Deposit.—A bunch-like deposit occurs in Sec. 12, T. 7 S., R. 4 E., in a ravine, 3 miles S. of DeForest, at 2,500′ elevation. It is undeveloped, and said to contain 57% metallic manganese.

Faville's, R., Deposit.—See our XIth Report, p. 374. It is in Sec. 34, T. 5 S., R. 4 E., 25 miles S.E. of Livermore, at 2,900′ elevation. The outcrop is high-grade ore, samples of which are said to assay 72% dioxide of manganese. Undeveloped.

Penitentia Creek.—See our XIIth Report, p. 330. It is a large bowlder on Penitentia Creek, in Alum Rock Park. The ore is of fair grade, and probably came from a bunch-like deposit up the stream.

Sonoma County.

Shaw's Mine.—See our XIIth Report, p. 330. It lies on the ridge 7 miles N.W. of Cloverdale. The top of a small hill seems to consist entirely of pyrolusite. An open cut, 6′ deep, is made through it, and about 60 tons of 65% to 75% ore lies on the dump. Idle. J. E. Shaw, of Cloverdale, owner.

MINERAL SPRINGS.

Alameda County.

Meyhew's Sulphur.—It is in an orange orchard, 600′ N. of Niles Station. The water is strongly sulphuretted, and said to possess important medicinal properties. H. A. Meyhew, of Niles, owner.

Piedmont White Sulphur.—See our XIIth Report, p. 331, for analysis. They are 3 miles N.E. of Oakland.

Warm.—They are 2 miles N.E. of Warm Springs Station. They flow a large quantity of water with a temperature of 94° F., and which is charged with sulphur and other minerals. The place was formerly a popular resort, but is now private grounds and the hotel is not opened to the public. Josiah Stanford, of Warm Springs, owner.

Alpine County.

Grover Hot.—They are situated 4 miles W. of Markleeville, on the mountain flanking the Middle Fork of the Carson River, at 6,000′ elevation. The water varies in temperature from 90° to 110° F., and is charged with gas. The smallest spring flows 1,600 and the largest 15,000 gals. daily. Several mounds, about 50′ high and 500′ across, have been formed from the sediment deposited from the waters. Bathing facilities have been provided and are well patronized. Mrs. H. A. Grover, of Markleeville, owner.

Butte County.

Mount Ida.—They are situated on the olive farm of Hon. John C. Gray, 4 miles E. of Oroville, and flow about 2 miner's inches. According to analysis made by M. E. Jaffa and Geo. E. Colby, the water contains:

	Grains in One Gallon.
Silica	2.07
Potassium sulphate	3.24
Sodium sulphate (Glauber's salts)	18.73
Sodium bicarbonate	1.12
Sodium chloride (salt)	8.52
Lithia (with spectroscope)	Strong.
Calcium carbonate	8.79
Calcium sulphate (gypsum)	2.57
Strontia (with spectroscope)	Strong.
Magnesium carbonate	2.85
Iron carbonate	0.70
Manganese carbonate	Traces.
Boracic acid (with spectroscope)	Strong.
Organic matter	Traces.
Total	48.59
Free carbonic acid gas per gallon	27.4
Temperature	65° F.

More than $6,000 worth was bottled and sold during 1895.

Colusa County.

Blank's Sulphur.—They are on Sulphur Creek, in Sec. 29, T. 14 N., R. 5 W., 27 miles S.W. of Williams, at about 1,900′ elevation. The water is strongly sulphuretted, has a temperature of 108° F., and is highly recommended for medicinal purposes. The improvements consist of a small, comfortable hotel, bath-houses, etc. Mrs. Lottie Blank, of Sulphur Creek, owner.

Cook's.—This group is in a narrow cañon on the west side of Indian Valley, in Sec. 9, T. 16 N., R. 6 W., 20 miles W. of Sites, by road, and at about 1,900′ elevation. The four important springs flow a small quantity each. The water is charged with sulphur, carbonic acid gas, carbonates of soda, magnesia, iron, and calcium, and has a temperature of 60° to 70° F. About 10,000 gals. are shipped annually; is used locally for medicinal purposes. The improvements are a small hotel, cottages, etc., for the accommodation of a limited number of guests. Young, Vance & Co., owners; Charles Young, of Leesville, manager.

Fouts'.—They are in Sec. 5, T. 17 N., R. 7 W., about 35 miles N.W. of Sites, by road. There are said to be five springs in the group, which have a small flow each. The small hotel will accommodate a limited number of guests; the place is also used as a camping resort. John F. Fouts, of Stony Ford P. O., owner.

Wilbur.—For analysis see our XIIth Report, p. 331. They are on Sulphur Creek, 25 miles S.W. of Williams, at about 1,800′ elevation, and have a strong flow of highly mineralized water with a temperature of 140° F.; locally used for medicinal purposes. John M. Moore, of San José, owner; Wm. Oeldart and A. G. Smith, of Sulphur Creek P. O., lessees.

Contra Costa County.

Alhambra Mineral.—They are in a narrow cañon in Sec. 2, T. 1 N., R. 3 W., about 5 miles S.W. of Martinez, at about 550′ elevation. There are two important springs; one of which flows 700 gals. daily. The water is strongly sulphuretted, and is used for bathing purposes. The following analysis is by Prof. E. W. Hilgard, of Berkeley:

	Grains per Gallon.	Parts in 10,000.
Sodium sulphate, potassium sulphate, etc.	57.12	9.78
Sodium carbonate (sal soda)	6.19	1.06
Sodium chloride (common salt)	399.77	68.44
Calcium chloride	182.13	31.18
Calcium sulphate; calcium and magnesium carbonates	5.37	0.92
Magnesium chloride	8.65	1.48
Silica	0.46	0.08
Organic matter, very small		
Totals	659.69	112.94

The water from the other one is bottled at the spring, and charged with natural carbonic acid gas from New Almaden. About 15,000 gals. are sold annually for drinking purposes. This spring flows about 2,900 gals. daily. Its water has been recently put on the market, and the demand is said to be rapidly growing. The water comes up through shales, which dip at a steep angle. Alhambra Mineral Springs Co., owner; D. J. West, of Martinez, secretary; Dr. O. G. Merrell, of Martinez, lessee.

Byron.—See our VIIIth and XIIth Reports, pp. 163 and 331, for copy of analyses, etc. They are in a small valley near the foothills on the eastern border of the San Joaquin Valley, 1½ miles from Byron Station. There are seven important springs that are improved, and numerous less important and unimproved ones. The waters principally come up through sandy adobe clay, which fills the valley. Natural gas is also obtained from shallow borings at the springs, and preparations are being made to utilize it for heating and illuminating purposes. The waters have temperatures of 50° to 140° F.; are strongly mineralized, and have a wide reputation for medicinal purposes. They are said to be efficacious in cases of rheumatism, neuralgia, liver, kidney, stomach, skin, and many other diseases. They are well improved, with comfortable hotel and bathing accommodations, etc. L. R. Mead, secretary Risdon Iron Works, San Francisco, owner; A. Bettens, of Byron, superintendent.

Fresno County.

Fresno Hot.—See our Xth Report, p. 189. They are on Hot Spring Creek, a tributary to Warthen Creek, 15 miles W. of Alcalde, at about 1,800′ altitude. The waters are said to have temperatures of 80° to 110° F., and are much used locally for medicinal purposes. Kreyenhagen Bros., owners; A. M. Barker, of Alcalde, manager.

Mercy.—They are in Little Panoche Valley, in the northwest corner of the county, 25 miles S. of Los Baños. Used locally for medicinal purposes. John J. Mercy, of Llanada, San Benito County, owner.

Humboldt County.

Cook's.—This is on North Yager Creek, 35 miles E. of Eureka. It is a spring containing sulphur and iron. F. W. Cook, of Iaqua, owner.

Felt's.—See our XIIth Report, p. 333. They are 5½ miles N.E. of Fortuna.

Humboldt Artesian Mineral Water Co.—For analysis see our XIIth Report, p. 333. Its well is on the edge of the bay, just S. of Eureka. The bottled product in 1895 amounted to 24,000 gals.

Mountain View.—It is on Mad River, 28 miles E. of Eureka. It is a small spring smelling strongly of sulphuretted hydrogen, and valued for medicinal purposes. Archie McBride, of Kneeland, owner.

Yager Creek.—Quite a number of mineral springs exist on the headwaters of this stream and on the ridge between it and Mad River. No improvements are made on any of them, although they are said to be of great medicinal value.

Inyo County.

Coso Hot.—They lie in the desert, 15 miles E. of Little Lake, and 35 miles S. of Keeler. The main spring is intensely hot. A number of steam vents in the vicinity deposit a yellowish mass, containing sulphur, which has a sour, astringent taste. Half a mile west of the main spring is another and smaller one, and here the ground is covered with silicious sinter and quartz in separate minute crystals, with here and there a small quantity of pyrite; no doubt a precipitate from the hot water. To the east, a short distance, a large area is covered with native sulphur, derived, probably, from the same source. Judge A. V. Davidson, of Independence, owner.

Lake County.

It is a mountainous county, lying in the Coast Range, 80 miles N. of San Francisco. It derives its name from Clear Lake, whose area is 180 square miles or more in extent. It occupies the center of a large fertile depression between two principal mountain ridges of the Coast Range. A number of mineral springs are found in the county, and many of them are used as sanitary resorts during the summer. Among the minerals, quicksilver takes the lead, and there are several large mines in the southern part of the county. Gold, silver, copper, sulphur, borax, and asbestos also occur, but are not mined at present.

Adams.—For analysis see our VIIIth Report, p. 327.

Allen.—For analysis see our XIIth Report, p. 334.

Anderson.—For analysis see our XIIth Report, p. 335.

Bartlett.—For analysis see our XIIth Report, p. 335.

Bonanza.—They lie between Howard and Ziegler springs, in a sequestered spot on the side of the mountain, at about 2,500′ elevation. They are 2 miles from Ziegler, 6 miles from Glenbrook, and 8 miles from Lower Lake.

Harbin.—For analysis see our XIIth Report, p. 336.

Highland.—They are 15 miles W. of Pieta, on the S. F. & N. P. R. R., at about 1,700′ elevation, and are about 30 in number.

ANALYSIS OF FIVE OF THE SPRINGS.

By W. B. RISING, Professor of Chemistry, University of California, June 2, 1882.

Names of springs	SELTZER.	DUTCH OR EMS.	MAGIC.	NEPTUNE.	DIANA.
Temperature	64.8° F.	70.5° F.	82.4° F.	81.7° F.	84.4° F.
		Grains per Imperial gallon.			
Chloride of sodium	0.723	1.862	1.290	1.680	1.899
Bicarbonate of soda	12.796	18.348	21.763	22.100	24.080
Bicarbonate of potash	0.489	0.770	0.544	0.803	1.466
Bicarbonate of lime	52.045	57.302	50.411	77.750	73.270
Bicarbonate of magnesia	34.872	67.634	70.243	89.870	78.950
Bicarbonate of iron	1.267	1.344	1.087	1.370	1.400
Bicarbonate of manganese	Trace.	Trace.	Trace.	Trace.	Trace.
Silica	5.245	7.126	7.398	8.420	8.079
Alumina	1.565	0.117	0.169	1.370	0.230
Organic matter	Trace.	Trace.	Trace.	Trace.	Trace.
Bicarbonate of baryta	------	------	------	0.175	0.200
Bicarbonate of lithia	------	------	------	Trace.	Trace.
Boracic acid	------	------	------	.470	Undet.
Free carbonic acid	100.250	87.822	74.462	94.120	71.850
Totals	209.252	242.325	227.367	298.128	261.424

Howard.—For analysis see our XIIth Report, p. 337.

Mills.—See our VIIIth Report, p. 328.

Saratoga.—See our VIIIth Report, p. 328.

Seigler.—See our VIIIth Report, p. 328.

Witter.—For analysis see our XIIth Report, p. 337.

Lassen County.

Big Hot.—Three miles north of Honey Lake.

Brenbeck's.—On the east side of Honey Lake; alkaline; boiling.

High Rock.—Nine miles east of Honey Lake; alkaline; 100° F.

Mud Springs.—Fifteen miles northeast of Honey Lake; hot; alkaline.

Shafer's Hot.—At north end of Henry Lake, containing hot (210° F.) solution of salts and sulphurets.

Marin County.

El Toro.—For analysis see our XIth Report, p. 251. It lies on Taylor's ranch, near Novato.

Rocky Point Hot Sulphur.—Fully described in our XIth Report, pp. 250–251. They lie on the beach below high-water mark, 8 miles S.E. of Bolinas.

Mendocino County.

California Seltzer.—For analysis see our XIIth Report, p. 333. They are 12 miles from Cloverdale.

Duncan's Mineral.—See our XIIth Report, p. 338. They are situated 1½ miles S.W. of Hopeland Station. There are seven springs; the principal ones are known as the borax, the two sodas, the sulphur, and the Duncan Spring, of which the last is the largest. The following analysis was furnished us by O. Howell, of Hopeland, the owner:

Duncan's Spring.

	Grains per Gallon.
Bicarbonate of magnesia	90.11
Chloride of magnesium	1.41
Sulphate of magnesia	1.64
Bicarbonate of lime	15.64
Silica	6.94
Bicarbonate of potash	2.37
Bicarbonate of soda	2.37
Free carbonic acid	36.57

Garby's.—It lies at the base of the foothills, 1 mile W. of Ukiah, and is a small, alkaline spring, highly prized by invalids. It is not improved. Mr. Garby, of Ukiah, owner.

Lane's.—It is in Redwood Valley, near Calpella. It has an alkaline, but pleasant taste. No improvements. Thomas Lane, of Calpella, owner.

Orr's Hot.—These three springs are in a narrow cañon of the South Fork of Big River, 14 miles N.W. of Ukiah, at 1,000′ altitude, and are named the *Cold Sulphur*, the *Hot Sulphur*, and the *Iron Spring*. The Hot Sulphur Spring has a temperature of 106° F., and the water is strongly impregnated with sulphur, etc. The baths are highly efficient for rheumatism and constitutional diseases. The bath-houses are near the spring in the cañon, and the grounds are tastefully arranged, with a view to furnish shade and comfort to visitors. The following analysis was furnished us by the manager:

Hot Sulphur Spring.

Silica	1.917
Silicate of soda	15.502
Oxide of calcium	0.425
Carbonate of lime	0.367
Carbonate of soda	0.175
Chloride of sodium	1.909

Orr Estate, owner; J. L. Orr, of Orr, manager.

Vichy.—For analysis see our XIIth Report, p. 338. They are 3 miles N.E. of Ukiah.

Mono County.

Buckeye Hot.—The five springs are on Buckeye Creek, 7 miles W. of Bridgeport, at 7,000′ elevation. The flow is about 3,000 gals. daily, and of a temperature of 80° to 100° F. Used locally for bathing. C. E. Heath, of Bridgeport, owner.

Fales' Hot.—They are situated at the junction of the Antelope and Sonora toll-roads, 14 miles W. of Bridgeport, at about 7,600′ elevation. The flow is great, and the water ranges in temperature from 100° to 180° F. It is quite a popular place of resort, and much esteemed for medicinal purposes. Good bathing facilities. A. S. Fales, of Bridgeport, owner.

Monterey County.

Bane's Soda.—See our XIIth Report, p. 340. It is about 6 miles S.W. of the Cruikshank Mine. Unimproved. J. W. Bane, owner.

Dolan's Hot Sulphur.—See our XIIth Report, p. 340. It is on the North Fork of Big Creek, 1½ miles from the coast. P. Dolan, of Sur, owner.

Helm's Soda.—See our XIIth Report, p. 340. They are 3 miles E. of Bane's Springs, at 1,600′ elevation. Unimproved. B. F. Munsa, of Simeon, owner.

Paraiso.—See our XIIth Report, p. 340. They are 7 miles S.W. of Soledad, in a mountain recess, at 1,500′ altitude. The waters of the three important springs are used for medicinal purposes, both by drinking and bathing. They are said to be efficacious in cases of gout, rheumatism, liver and kidney diseases, etc. The temperature of the water of the "soda spring" is 118° F., and of "sulphur spring," 105° F. The following analysis of the water from soda spring was made by Prof. Hilgard, of Berkeley, in 1893:

	Grains per Gallon.
Organic matter	5.25
Silica	2.62
Alumina and iron	1.60
Potassium chloride	0.35
Sodium chloride	3.50
Soda sulphate	35.50
Soda carbonate	4.23
Lime sulphate	4.32
Lime carbonate	1.43
Total	58.80

The rocks which outcrop near the springs are a granulite, composed principally of quartz, mica, and iron. Well improved for accommodation of guests. W. W. and Mary A. Ford, owners; R. Robertson, manager.

Slate's Hot Sulphur.—See our VIIIth and XIIth Reports, pp. 411 and 341. They issue from bluffs facing the coast. Unimproved. Mr. Little, owner.

Tassajara.—See our VIIIth and XIIth Reports, pp. 411 and 341. They are in a deep cañon, tributary to the Arroyo Seco, 50 miles S. of Salinas, by road, and about the same distance from Monterey, at 1,650′ altitude. The waters are said to be efficacious in cases of rheumatism, stomach, liver, kidney, and cutaneous diseases. A small hotel and bathhouse constitute the improvements. The following copy of analysis was furnished by the manager. Each Imperial gallon contains $10\frac{5}{6}$ grains of mineral constituents, as follows:

	Per Cent.
Sulphate of soda	15.04
Sulphate of magnesia	13.17
Sulphate of lithia	3.10
Silica acid	8.50
Organic matter	18.00
Carbonic acid	22.46
Potash	1.45
Sulphuric acid	2.41
Hydrogen and sulphur	3.00
Alumina	3.87
Sesquioxide of iron	7.08
Iodine	0.75
Arsenious acid	1.08
Bromine	0.09
Total	100.00

C. W. Quilty, of San José, owner; Henry Arnold, of Salinas, manager.

Napa County.

Calistoga.—See analysis in our VIIIth Report, p. 416. They are near and east of Calistoga. Hot sulphur-water can be had by boring in and around Calistoga. The water, which is much hotter than the boiling-point below the surface, seems to contain quicksilver in the form of vapor, which is precipitated near the surface, where the water cools. The clay in and around the springs is impregnated in this way with very fine globules of mercury. The springs are deserted. Leland Stanford Estate, owner.

Etna.—See analysis in our VIIIth Report, p. 416. They lie at the head of Pope Valley, 16 miles N.E. of St. Helena.

Napa Soda.—See analysis in our VIIIth Report, p. 416. They lie on the mountain side, 6 miles E. of Napa.

Samuels' Soda.—See analysis in our XIIth Report, p. 341. They lie 20 miles E. of St. Helena, in a narrow cañon.

White Sulphur.—They lie 2½ miles S.W. of St. Helena, and consist of 9 springs, with a temperature from 69° to 142° F. The waters are light, sulphuretted, and alkaline, and much extolled by many.

ANALYSES OF WHITE SULPHUR SPRINGS.

Analyses Nos. 2, 6, and 7, by Prof. Le Conte, in 1871. Analyses Nos. 5 and 9, by Dr. W. Anderson, in 1888.

Ingredients.	Grains in U. S. Gallon.				
	No. 2. Temperature, 89.6° F.	No. 5. Temperature, 77.2° F.	No. 6. Temperature, 86° F.	No. 7. Temperature, 69.8° F.	No. 9. Temperature, 69° F.
Sodium chloride	21.72	22.36	23.41	14.23	11.91
Sodium carbonate	----------	0.09	----------	----------	2.14
Sodium sulphate	8.26	10.60	11.33	12.84	7.15
Magnesium chloride	0.87	1.41	2.22	0.65	0.45
Magnesium carbonate	0.62	0.75	0.56	4.36	2.70
Calcium chloride	1.32	0.93	0.86	0.78	0.35
Calcium carbonate	1.25	1.87	2.45	5.56	5.82
Calcium sulphide	----------	0.53	----------	----------	Trace.
Sodium sulphide	2.65	0.76	1.85	1.62	Trace.
Alumina	----------	0.23	----------	----------	0.62
Silica	----------	0.62	----------	----------	1.43
Organic matter	----------	Trace.	----------	----------	Trace.
Total solids	36.69	40.15	42.68	40.04	32.57
Specific gravity	1.00026	1.00038	1.00040	1.00038	1.00023
Sulphuretted hydrogen gas	6.15 cu. in.	5.19 cu in.	4.25 cu. in.	Trace.	Trace.

Plumas County.

Sulphurous and alkaline springs, both hot and cold, are scattered throughout the county, but, aside from local use, little importance attaches to them. See our XIIth Report, p. 342.

Arlington.—They are on the road between Crescent Mills and Taylorsville. The waters are chalybeate, and contain also magnesia and soda. They are used locally, and are said to be beneficial in dyspepsia.

Battle Creek (*Dr. Soupan's*).—On a branch of Battle Creek are hot sulphur springs. Near the head of Battle Creek are several hot soda springs, with heavy flows, and with a temperature from 196° to 200° F.

Boiling Lakes.—See our XIIth Report, p. 342. Situated near Lassen Peak is a boiling lake containing thick, grayish-white, intensely hot water; also three large boiling springs, 20′ in diameter, ejecting water in a cone; in one case 15″ to 20″, and in the other from 4′ to 6′ high.

Chipps.—On Chipps Creek is a large soda spring.

Cold Soda Lake.—This is near the head of Mill and Battle creeks, south of Lassen Peak. The water is sparkling, cool, and palatable.

Hot Sulphur Spring Ranch.—This is on the Mohawk Valley road, and has several hot sulphur springs, used locally for bathing.

Humbug Valley—A large soda spring is situated here, and is used a good deal by camping parties.

Lake Cañon.—South of the lake are alkaline springs, with a temperature of 85° F.

Indian Valley.—At the west end, near the edge of Greenville, is a boiling hot spring, used locally for bathing in cases of rheumatism.

Warner Creek.—Near its mouth are a number of small geysers, with temperature near the boiling-point, and emitting sulphurous vapors and steam.

Willow Creek.—At its mouth are numerous small geysers.

San Benito County.

Anderson's San Benito.—It is 4 miles S.E. of Hollister, at about 500′ altitude. The water is used locally for medicinal purposes, and a limited quantity is bottled. It is said to flow 6,000 gals. per day. The following analysis is by Prof. Jaffa, of Berkeley, Cal.:

	Grains per Gallon.
Sodium and potassium sulphates	62.99
Sodium chloride	54.56
Sodium carbonate	8.67
Calcium carbonate	3.86
Calcium sulphate	0.54
Magnesium carbonate, etc.	3.70
Iron carbonate	1.07
Silica, organic matter, and chemically combined water	10.97
Total	146.36

E. J. Anderson, of Tres Pinos, manager.

San Luis Obispo County.

El Paso Robles.—For analysis see our XIIth Report, p. 344. They are at the town of Paso Robles, on the S. P. R. R., in the Salinas Valley, 216 miles S. of San Francisco, at about 730′ altitude. They are widely known for their medicinal qualities, and the place is an elegantly improved health and pleasure resort. D. W. James, of Paso Robles, owner; — Burns, of Paso Robles, manager.

Kessler's.—It is at the "onyx" quarry, 16 miles N.E. of Arroyo Grande, at about 1,800′ altitude. The water is very strongly charged with minerals, which form a heavy deposit about the spring. It is a strong purgative, said to be effective as a wash for curing cutaneous diseases, and flows about 600 gals. per day. Unimproved. J. & F. Kessler, of San Francisco, owners.

Newman's Arroyo Grande Warm.—They are in Sec. 23, T. 32 S., R. 13 E., at about 400′ altitude, in a narrow valley, tributary to Arroyo Grande River, 14 miles S. of San Luis Obispo, and 2½ miles E. of Arroyo Grande. The waters are saline-sulphuretted, and are recommended for rheumatism, catarrh, dropsy, liver, kidney, stomach, and cutaneous diseases, etc. The following analysis is by Dr. Winslow Anderson:

Temperature of water, 100.5° F.	Grains in U. S. Gallon.
Sodium chloride	4.10
Sodium carbonate	1.75
Sodium sulphate	3.92
Potassium carbonate	0.15
Potassium sulphate	2.90
Magnesium carbonate	6.41
Magnesium sulphate	2.47
Calcium carbonate	8.25
Calcium sulphate	0.76
Ferrous carbonate	3.98
Alumina	0.33
Silica	2.03
Organic matter	0.27
Total	37.32
Free carbonic anhydride	14.90 cu. in.
Free sulphuretted hydrogen	3.56 cu. in.

Santa Ysabel.—They are 2½ miles S.E. of Paso Robles, at 1,000′ altitude. Analysis of waters is given in our XIIth Report, p. 344.

Sycamore Hot Sulphur.—See our Xth Report, p. 577. This health and pleasure resort is on the San Luis Creek, 7 miles S.W. from San Luis Obispo, at about 35′ altitude. The "spring" is a well, bored in 1885–87, which is 8″ in diameter, 935′ deep, and said to flow 144,000 gals. water and 16,800 cu. ft. gas per day. The gas is collected and used for illumination and fuel. The following analysis, made at the State University, was furnished by A. Walker, of Root, owner:

Temperature, 103° F.	Per Cent.
Sulphuretted hydrogen gas	6.40
Free carbonic acid gas	14.06
Sulphate of lime	4.02
Sulphate of soda	4.10
Peroxide of iron	4.06
Silica	1.60
Bicarbonate of magnesia	6.04
Arsenic	16.06
Sulphur	12.00
Chloride of sodium	9.02
Iodine and bromides	0.07
Peroxide of manganese	1.44
Bicarbonate of soda	21.00
Organic matter	0.13
Total	100.00

Santa Barbara County.

Burton Mound.—They are in Santa Barbara, and near the beach. The water flows from a low mound in about fifteen places; the strongest of which flows 5,000 gals. daily. It is used for medicinal purposes, and is said to be efficacious in cases of rheumatism, cutaneous diseases, etc. E. Kimberley, manager.

Cucano Hot.—See our XIIth Report, p. 345.

Las Cruces Hot.—See our XIIth Report, p. 345.

Montecito Hot.—See our XIIth Report, p. 345.

Mountain Glen Hot.—See our XIIth Report, p. 345.

Santa Barbara Hot Sulphur.—They are in a narrow cañon facing the ocean, 6½ miles N.E. of Santa Barbara, at 1,450′ altitude. The water flows from gray sandstone in numerous places, and its temperature is 93° to 122° F. A small hotel and bath-house have been erected. These springs are recommended for rheumatism, liver, stomach, kidney, and cutaneous diseases. J. A. Kimberley, manager.

San Marcos.—See our XIIth Report, p. 345.

Veronica.—It is 3 miles W. of Santa Barbara, and affords a small quantity of mineral water, which is used locally. Veronica Mineral Water Co., owner; W. A. Hanley, of Santa Barbara, manager.

Santa Clara County.

Almaden (Vichy).—See our VIIIth Report, p. 549. It is at Hacienda, 12 miles S. of San José. It has ceased flowing, and is now pumped. The quantity of contained carbonic acid gas has also decreased since the great quantity was struck in the mine. It is re-charged with gas from the mine, and bottled by the National Mineral Water Co., of San José;

24,000 gals. are said to be shipped annually. H. C. Fister, of San José, secretary.

Alum Rock.—For analysis see our XIIth Report, p. 345. They are in Alum Rock Park, on Penitentia Creek, 7 miles N.E. of San José, at 550′ elevation. There are three important springs, each of which has a small flow. The waters are extensively used for medicinal purposes, and elegant bath-houses are provided at the springs. H. B. Alvord, of San José, secretary; E. E. Munn, of San José, superintendent.

Azule.—It is in a narrow ravine, 1½ miles N.W. of Pacific Congress Springs, and 13 miles W. of San José, at 900′ elevation. It is but little improved, and is in a region of metamorphosed shales and ferruginous sandstones; is said to flow about 2,500 gals. daily, and 25,000 gals. are bottled and shipped per month. The following analysis is by James Howden:

	Grains per Gallon.
Free carbonic acid	152.24
Sodium chloride	90.88
Magnesium chloride	18.48
Potassium chloride	12.44
Magnesium carbonate	77.20
Sodium carbonate	50.88
Calcium carbonate	9.00
Total	411.12

Azule Natural Seltzer Water Co., owner; H. C. Fister, of San José, manager.

Coe's.—It is on the slope of Pine Ridge, 1 mile W. of Madrone Springs, 11 miles E. of Madrone, and is unimproved. The following analysis is by M. E. Jaffa, Berkeley, Cal.:

	Grains per Gallon.
Sodium and potassium sulphates (Na_2SO_4 and K_2SO_4)	1.94
Sodium chloride ($NaCl$)	0.61
Sodium carbonate (Na_2CO_3)	5.57
Calcium carbonate ($CaCO_3$)	12.15
Calcium sulphate ($CaSO_4$)	0.41
Tricalcic phosphate ($Ca_3(PO_4)_2$)	0.65
Magnesium carbonate ($MgCO_3$)	36.80
Iron carbonate ($FeCO_3$) and traces of alumina	2.50
Silica (SiO_2)	5.66
Organic matter and chemically combined water	11.28
Total	77.57

C. & H. Coe, of Madrone, owners.

Gilroy Hot Sulphur.—It is 14 miles N.E. of Gilroy, at 1,450′ elevation. The water has a temperature of 109° to 115° F., flows about 135,000 gals. daily, and is said to be efficacious in cases of rheumatism, kidney, liver, stomach, and blood diseases. It is well improved for the accommodation of 250 guests, and is open all the year. George W. Roop, of Gilroy, manager.

Madrone.—They are on a tributary of Coyote Creek, in a well-timbered, mountainous region, 12 miles E. of Madrone by stage road, at about 2,200′ elevation. There are four important springs, known as the *Soda*, *Iron*, *Sulphur*, and *Arsenic* springs, and numerous less important ones. The water of the soda spring is that most used. Some 12,500 gals. are shipped annually, and considerable used at the springs. It is said to be efficacious in cases of stomach, liver, kidney, and malarial diseases, asthma, etc. Hotel and cottages are provided for the accommodation of guests, from May 1st to November 1st. The following analysis of the soda spring water is by Prof. Geo. E. Colby, State University, Berkeley:

Temperature of spring, 58°-60° F.	Grains per U. S. Gallon.
Silica	6.34
Potassium (bi) carbonate	1.11
Sodium chloride	1.36
Sodium bicarbonate	44.43
Lithium (with spectroscope)	Traces.
Calcium carbonate	55.10
Calcium phosphate	0.31
Barium carbonate	0.10
Strontium (with spectroscope)	Traces.
Magnesium carbonate	12.84
Iron carbonate	0.56
Manganese carbonate	0.10
Boracic acid	Traces.
Organic matter	Traces.
Total	122.25

H. G. Dyer, of Madrone, manager.

Pacific Congress.—See our XIIth Report, p. 345, for full analysis. They are in Campbell Creek Cañon, 1 mile above Saratoga, and 12 miles S.W. of San José, at about 850′ elevation. There are three springs in the group, which have a small flow of strongly mineralized water. Considerable gas escapes from the strongest one, which is collected in a receiver over the spring, and used in charging the water when bottled at the springs. About 5,000 gals. are shipped annually, and considerable is used at the springs for medicinal purposes. The place is a popular health and pleasure resort, and is provided with a comfortable hotel, cottages, etc. Extensive improvements are being made. An electric railroad is to be constructed from San José to the springs. J. F. Pfetch, of Saratoga, lessee.

Santa Cruz County.

There are a number of mineral springs, which are said to possess more or less medicinal properties. They are yet unimproved, however, and only locally known. They are said to occur toward the head of Soquel Creek and in the Corralitos Valley.

Chittenden's Sulphur.—They are on the Chittenden ranch, near the railroad station of that name. The waters issue from shales in six to eight places within a small area, each of which flows a small quantity of water. The waters are heavily charged with sulphur, iron, and other minerals. They are locally known for their medicinal properties, and, though they are unimproved, are visited to some extent in summer by campers. Mr. Chittenden, owner.

Shasta County.

Castle Rock.—See our XIIth Report, p. 346.

Chalybeate.—See our XIIth Report, p. 346.

Hibbs' Soda.—See our XIIth Report, p. 346.

Lower Soda.—See our XIIth Report, p. 346.

Salt Springs are found along the banks of Stinking or Salt Creek, 12 miles E. of Redding.

Sulphur Springs.—There are several hot sulphur springs along the banks of the Sacramento River, near to, as also opposite, the mouth of

Kosk Creek at the "big bend"; the waters are of a scalding temperature. Locally they are used for rheumatic troubles.

Between Middle Creek and Shasta are cold sulphur springs, but they are not put to any use.

Sierra County.

Campbell's Hot Sulphur.—It is 1½ miles from Sierraville, at 5,050′ elevation, and has five or six available springs on the place. The main spring, with a temperature of 104° F., flows 1,000 gals. per hour; the water contains (according to Prof. Wilson, of Reno) iron, sulphur, magnesia, etc. It is used for both drinking and bathing purposes, and is said to be beneficial for rheumatic complaints and skin diseases. There are tub and plunge baths, and good hotel accommodations, making it a pleasant resort. H. Pearce, of Sierraville, owner.

Siskiyou County.

Shasta.—See our XIIth Report, p. 449. They are situated 4 miles N. of Dunsmuir, on the east bank of the Sacramento River; they have a flow of 20 bbls. per hour, a temperature of 51° F., and contain, according to the analysis made by Prof. Walter S. Haines, M.D., solid matter in each Imperial gallon, as follows:

	Grains.
Sodium bicarbonate	63.420
Sodium chloride	34.353
Sodium biborate	1.628
Sodium arsenate	0.151
Sodium phosphate	0.102
Sodium iodide	Traces.
Sodium bromide	Traces.
Potassium chloride	2.133
Potassium sulphate	1.071
Lithium bicarbonate	0.013
Calcium fluoride	Traces.
Magnesium carbonate	84.757
Iron carbonate	1.450
Manganese carbonate	0.013
Alumina	0.334
Total	189.425

Carbonic acid undetermined.

The following analyses of the waters of two new springs were made by Dr. W. D. Johnston, Chemist of the State Mining Bureau, in September, 1893:

No. 1. One Imperial gallon contains:	Grains.
Silica	2.315
Calcium carbonate	1.680
Sodium carbonate	0.970
Sodium chloride	1.330
Calcium sulphate	0.850
Magnesium sulphate	1.157
Total	8.302

Carbonic acid undetermined.

No. 2. One Imperial gallon contains:	Grains.
Silica	2.330
Calcium carbonate	1.872
Sodium carbonate	1.030
Sodium chloride	1.700
Calcium sulphate	0.980
Magnesium sulphate	1.619
Total	9.531

Carbonic acid undetermined.

This water is bottled extensively at the springs, and also shipped in porcelain-lined tank-cars to San Francisco, where it is placed in siphon bottles and re-charged with carbonic acid gas. Eighteen people are employed at the springs and at the works in the city. Mount Shasta Mineral Springs Co., Sixth and Berry streets, San Francisco, owner.

Garrison.—They lie on Beaver Creek, 15 miles N.E. of Oak Bar. There are three springs close together. One contains considerable carbon dioxide gas, and the others are strongly alkaline. No improvements. The waters are said to be a specific for constitutional complaints. J. Garrison, of Oak Bar, owner.

Solano County.

Tolenas.—For analyses see our XIIth Report, p. 346. They are 5 miles N. of Suisun, at about 1,200′ elevation. The water is bottled at the springs and re-charged with the free carbon dioxide gas which escapes from the water as it flows from the spring. About 8,000 gals. are shipped annually. Tolenas Springs and Onyx Co., owner; W. H. Chittenden, of Suisun, superintendent.

Vallejo Sulphur.—See our XIIth Report, p. 347. It is 4 miles N.E. of Vallejo, and flows a large quantity of sulphuretted water, which is highly recommended for medicinal purposes. James Kelly et al., of Napa, owners.

Sonoma County.

Agua Caliente Thermal.—See our XIth Report, p. 458.

Agua Rica Hot Sulphur.—See our XIIth Report, p. 347. They are 2 miles N. of Sonoma, and on the line of S. F. & N. P. R. R. They are sixteen in number, varying in temperature from the cool iron and soda water to the hot saline-sulphurous springs, registering 111.5° F. On the property also there are mud (bath) springs, whose merits are highly extolled.

ANALYSIS OF WHITE SULPHUR SPRING.

By A. AUCHIE CUNNINGHAM, F.C.S., F.I. Inst. Lond., etc., Analyst, 1895.

Temperature	111.5° F.
Quantity	300,000 gals. in 24 hrs.
Specific gravity (at 60° F.)	1001.8

Mineral Ingredients.	One U. S. Gallon contains: Grains.
Potassium sulphate	0.351
Potassium chloride	0.913
Sodium chloride	34.897
Sodium carbonate	2.874
Lithium	Trace.
Calcium carbonate	2.863
Magnesium carbonate	0.267
Ferrous carbonate	0.071
Silica	7.500
Boracic acid	Trace.
Sulphuretted hydrogen	0.124
Organic acids	0.099
Hydrogen gas	0.005
Total	49.964

Reaction slightly alkaline.

Burn's.—See our XIIth Report, p. 347.

Geysers.—See our VIIIth and Xth Reports, pp. 673 and 635.

Lytton.—See our VIIIth and Xth Reports, pp. 675 and 634. These springs are at Lytton Station, on the S. F. & N. P. R. R., 70 miles from San Francisco. The company furnishes the two following analyses:

CALIFORNIA SELTZER SPRING.

Temperature, 62° F.	Grains per U. S. Gallon.
Sodium chloride	79.34
Sodium bicarbonate	6.29
Sodium carbonate	72.73
Potassium carbonate	3.60
Magnesium bicarbonate	13.90
Magnesium sulphate	6.75
Calcium bicarbonate	14.05
Calcium sulphate	5.03
Ferrous carbonate	2.14
Alumina	6.81
Borates	4.43
Lithium	Trace.
Ammonia	.33
Silica	8.09
Organic matter	Trace.
Total solids	223.49
Free carbonic acid gas	375.60

GEYSER SODA SPRING.

	Grains per U. S. Gallon.
Sodium chloride	8.93
Sodium bicarbonate	21.16
Potassium carbonate	Trace.
Magnesium sulphate	1.14
Ferrous carbonate	2.09
Organic matter	Trace.
Sodium carbonate	4.97
Sodium sulphate	2.60
Magnesium bicarbonate	9.03
Calcium carbonate	4.90
Silica	3.75
Total solids	58.57

Mark West.—See our VIIIth Report, p. 634.

Skaggs.—See our VIIIth and Xth Reports, pp. 634 and 675.

Tehama County.

Colyear's.—They are situated 35 miles W. of Red Bluff, at an approximate elevation of 3,000′, and near the Tehama Chrome Mine; only locally used. J. Colyear, of Red Bluff, owner.

Morgan's.—They are 50 miles N.E. of Red Bluff, at an elevation of about 7,000′; used locally. Mrs. Morgan, of Red Bluff, owner.

Poison and Kid.—They, with several sulphate of magnesia springs, are situated on the Tehama County Chrome Co.'s land, 28 miles W. of Red Bluff, and are used to some extent locally. A partial test of the former, by C. A. Ogden, Ph.D., shows it to contain: Sodium chloride, calcium chloride, sodium bromide, and a vegetable substance of a peaty nature, not further tested, that gives the water an oily appearance. Tehama County Chrome Deposit Co., of Red Bluff, owner.

Tuscan.—See our Xth and XIIth Reports, pp. 693 and 347. They are situated 8 miles N.E. from Red Bluff, at an elevation of 925′, and are found issuing over an area of 10 acres, in a basin of sedimentary rocks about 600′ across an anticlinal axis surrounded by volcanic bluffs. They are entirely free from surface drainage, and unite and flow off into Little Salt Creek. Fifty of these springs are known, but less than half this number have been improved. Although known and used for a number of years, no attempt has been made to have the different springs carefully analyzed, notwithstanding the fact that they appear to vary widely in their composition; some of them evolve a large amount of carburetted hydrogen, which is used for heating the waters for bathing purposes. The natural temperature of the springs varies from 67° F. to 94° F. The heaviest constant flow of gas issues from a spring, designated as No. 17, at the rate of 20,000 cu. ft. per day. A partial analysis of the waters made in 1856 by Dr. L. Lantzwert, from what is known as the Red Spring, gave sulphuric, hydrochloric, and carbonic acids in combination with iron, lime, sodium, and potassium. Iodine, to the extent of 6 grains per Imperial gallon, and 1 grain of lithia per gallon, were also found. The springs have a saline and sulphurous taste, and show in the waters a variety of colors, as black, white, milk-blue, yellow, green, and pink. Those of the springs that are chiefly in use are numbered, and faced with cement. No. 1 is used for bathing purposes; No. 7 for granulated eyelids; No. 8, the strongest spring, is used for throat, lung, and heart trouble; No. 15 is largely Epsom salts; No. 10 is used for kidney diseases. The greatest good is accomplished by the use of these waters in severe cases of blood poison (syphilis), skin diseases, and rheumatism. The waters are used in connection with hot, cold, and mud baths. Besides a number of tub baths, a plunge basin, 30′ by 60′ and from 4′ to 13′ deep, is provided. Regular bottling works have been started; cases containing three dozen quart bottles are sold for $3 per case, or 50 cents per gallon in demijohns. Four hundred cases were shipped in 1895. There is a good hotel at the springs, which is connected by an 8-mile wagon-road with Red Bluff. To obtain a constant supply of pure drinking water, two tunnels were driven into the bluff back of and above the hotel, 130′ and 180′ long, and a shaft sunk in which the water stands to within 8′ of the tunnel level, and is withdrawn by siphon into two tanks of 5,000 and 8,000 gals. capacity. One of these tanks is built of brick and cement; the smaller one is of galvanized zinc. Through 7,000′ of ¾″ pipe the entire property is provided with water. E. B. Walbridge, of Tuscan, owner.

Trinity County.

Coombs.—They are located on the west bank of Brown's Creek, on Secs. 6 and 7, T. 30 N., R. 9 W., 21 miles from Douglas City and 28 miles from Weaverville. There are quite a number of springs, but only four are used medicinally; of these, one is designated the Black Sulphur Spring, and another the White Sulphur Spring. Have not been analyzed, but are known to contain sulphur, iron, soda, and lime. The waters are cold, and have a wide local reputation for their curative effect upon rheumatism and venereal diseases.

Ventura County.

Santa Paula Sulphur.—They are in a narrow cañon, about 6 miles N. of Santa Paula, at 900′ altitude. There are two important springs, which flow a small quantity of water, used principally for medicinal purposes. It is a popular camping resort in summer. H. H. McCutchan, of Santa Paula, manager.

Sespe Hot.—It is in a cañon tributary to Sespe Creek, 35 miles N.W. of San Buenaventura, at 3,000′ altitude. It flows a large quantity of water, almost boiling hot, and deposits a yellowish-green sediment. It is on Government land, and can be reached only by trails.

MINING AND IRRIGATING CANALS, ARTESIAN WELLS, ETC.

Alameda County.

The artesian wells in this county are principally in the vicinity of Alvarado, and in the Livermore Valley, near Pleasanton. The salt works in the marsh W. of Alvarado obtain their fresh water principally from artesian wells, which are 175′ to 200′ deep. The quantity of water which they flow has materially decreased since the Oakland Water Co.'s wells were bored at Alvarado. There are very many wells in the cities of Alameda and Oakland from 100′ to 250′ deep, which are pumped by windmills for domestic purposes.

County-Road Well.—It is on the county road in the lowland, 1¼ miles N. of Pleasanton. It is 7″ in diameter, 70′ deep, and flows 1″ over the casing. The strata penetrated are—

Alluvial sediment	10′
Blue clay	45′
Water-bearing gravel	15′

Granger's, F. B., Well.—It is near the railroad depot at Alvarado. It is 7″ in diameter, 177′ deep, and said to flow 100,000 gals. daily. The strata penetrated are principally clay, with a thin bed of sand at a depth of 68′, and a heavy bed of water-bearing gravel in the bottom.

Harm's, A., Well.—It is 1¼ miles N. of Pleasanton, and is 7″ in diameter, about 70′ deep, and flows about 1″ over the casing. The strata penetrated are—

Sandy loam, etc.	10′
Blue clay	40′
Sand and gravel	20′

Helwig's, P., Well.—It is at Alvarado. It is 10″ in diameter, 252′ deep, and flows 1¼″ over the casing. The water is obtained from beds of gravel, which are overlaid by impervious clays.

Kottinger's, J., Well.—It is in a narrow valley, ½ mile E. of Pleasanton, at 50′ elevation above the town. It is 7″ in diameter, 71′ deep, and said to have flowed 4″ over the casing when completed. It now leaks through the casing, and the flow has decreased. The strata penetrated are impervious blue clay and gravel.

Lilienthal's, E. R., Wells.—These two wells are on the "hop ranch," ½ mile N. of Pleasanton. They are 7″ in diameter, 49′ and 51′ deep, and flow 2½″ and 4″ over the casings. The strata penetrated are alluvial sediment, clay, and gravel.

Oakland Water Co.'s Wells.—This company has recently bored eighteen wells immediately S. of Alvarado, laid mains to Oakland, and erected a pumping-plant at Alvarado to force the water to Oakland, etc. The wells are 10″ to 20″ in diameter, 175′ to 500′ deep, and have a total flow of 12,000,000 gals. daily. Water pipes tap the wells 8′ below the surface and carry the water to the reservoir at the pumping-plant. They are provided with gates, which regulate the flow of water. The wells are provided with outside casings to a depth of 40′, and the intervening space between the inside and outside casings is filled with cement. They penetrate beds of clay, 40′ to 50′ thick, alternating with beds of water-bearing sands and gravels, 4′ to 10′ thick. W. C. Beatie, of No. 458 Eighth Street, Oakland, secretary; William J. Dingee, of Oakland, manager.

Silva's, F., Well.—It is 1¼ miles S.W. of Pleasanton, and is 7″ in diameter, 47′ deep, and flows 14″ over the casing, which extends 2′ above the surface. The strata penetrated are—

Soil	2′
Blue clay	43′
Gravel	2′

Amador County.

Amador Canal and Mining Co.—The source of supply, Blue Lakes, has been increased by large impounding works. The water flows down the North Fork of the Mokelumne River to a point a few miles E. of West Point, where it is picked up by the main line, which is 7′ wide on top, 5′ on the bottom, and 3′ deep, with a grade of 8′ per mile. The capacity is 2,500 miner's inches. The main system is 42½ miles in length. Used for power, placer mining, and irrigation. Blue Lakes Water Co., owner; W. E. Proctor, of Sutter Creek, superintendent.

Interior Development Co.—The water is diverted from the Cosumnes River at a point about 4 miles N.W. from Plymouth, and delivered by two main lines of ditch and flume to the hydraulic mines at Michigan Bar, Sacramento County. A ditch has been constructed nearly to Galt, and it is the intention to use the surplus water for irrigation purposes. Interior Development Co., of San Francisco, owner; D. R. Thomas, of Michigan Bar, superintendent.

Volcano Ditch.—It is 35 miles long, carrying 2,000 inches of water, which is taken from Panther and Tiger creeks. This water is distributed to mines at Rancheria, Volcano, Oleta, etc. McLaughlin Estate, owner; Clarence Bradshaw, of Volcano, superintendent.

Butte County.

The valley lands of this county are noted for their extensive orchards, vineyards, grain fields, etc. From near the railway westward the soil is black, sandy adobe, which is easily worked and yields largely. The gravel-tufa soils, known as red-lands, in the northeastern part of the valley, are less productive, and poorly supplied with subterranean water. Where irrigation is practiced the water is diverted from streams on the eastern side of the county, or pumped from wells in the valley. No large canals have been constructed, though the natural advantages are good. A large canal is projected, taking water from Feather River 3 miles below Oroville, and coursing westerly through Biggs, thence southerly through Gridley to the "Buttes." The subterranean water-supply in most parts is almost inexhaustible, although there are no flowing wells. See our XIth Report, p. 165. At Biggs water is obtained at 15′ to 22′ in depth, and a second water-bearing stratum at 60′ to 100′ in depth, separated by clay. At Chico water is obtained at 15′ below the surface, but better water may be had at 25′ to 30′ depth. The two wells of the Chico Waterworks are 30′ deep and yield, by pumping, 700,000 gals., without diminishing the supply appreciably. At Gridley a large supply may be obtained at 40′ to 160′ in depth.

Cherokee Ditch.—See Spring Valley Hydraulic Co.

Chico V-Flume.—It extends from Chico to the Sierra Lumber Co.'s sawmills in the northeastern part of the county. It has 26″ sides and is about 25 miles long. It diverts water from Chico Creek, and is used to transport lumber from the mills to Chico. Sierra Lumber Co., owner; C. E. Tinkham, of Chico, superintendent.

Miocene Ditch.—It heads on the West Branch of Feather River, near Magalia, and runs to Oroville. It is 36 miles long, 9′ wide on top, 6′ on bottom, and 4′ deep, with an 8′ grade, and of 2,000 miner's inches capacity.

Palermo Ditch Co.—The head of this irrigation canal is on the South Fork of Feather River. It is 8′ on top, 6′ on the bottom, and 4′ deep, with a varying grade, and a capacity of 2,200 miner's inches. The entire length of the ditch and branches is 30 miles. About 1½ miles above Oroville it empties into a reservoir, which feeds the branches. The price of the water is 12½ cents per miner's inch for twelve hours. It is now used entirely for irrigation purposes. J. Boyle, of Oroville, manager.

South Feather Water and Union Mining Co., usually known as the *Forbestown Ditch*, takes its water partly from Lost Creek, opposite Strawberry Valley, at 3,250′ altitude, and partly from Dry Creek. The main line from Lost Creek is 6½′ wide on the bottom for a distance of 18 miles to Forbestown; thence for 12 miles it is 5′ on the bottom, with a grade of 9.6′ per mile, and a capacity of 2,000 miner's inches. The line from Dry Creek extends to Wyandotte, Hanson, and Bangor. It is 20 miles long, 3′ wide on the bottom, with a grade of 16′ per mile, and capacity of 300 miner's inches. The charge is 10 cents per inch for twenty-four hours. Four men are employed. An incorporated company, of No. 530 California Street, San Francisco, owner; A. Halsey, secretary; H. R. Kimball, of Forbestown, superintendent.

Calaveras County.

Union Ditch and Flume.—The main line is 25 miles long, 6′ wide on top, 4′ on the bottom, 3′ deep, and of 1,200 miner's inches capacity. The water is taken from the North Fork of Stanislaus River, and is used chiefly by the mines of the Utica-Stickle group, at Angels, after which it is distributed to various mines of that vicinity. Hayward, Lane, et al., of San Francisco, owners; C. D. Lane, superintendent.

Mokelumne Hill and Campo Seco Ditch.—The main canal is 35 miles long and has a capacity of 2,000 miner's inches. The size of the ditch varies with the grade. The water is diverted from the South Fork of Mokelumne River, and is used by various mining companies near Mokelumne Hill, and also by placer miners about Campo Seco, Lancha Plana, and Camanche. Mokelumne Hill and Campo Seco Canal and Mining Co., of Mokelumne Hill, owner; Charles Prindle, superintendent.

Table Mountain Ditch.—This takes water from San Antonio Creek, and is 15 miles long. Its capacity is 500 miner's inches. The water is used in placer and drift mines near Cave City. Treat & Wylie, of San Andreas, owners.

Colusa County.

The valley lands of this county are well supplied with subterranean water, which may be had by pumping. No deep borings have been made to determine the possibilities of artesian wells. Water is obtained in most parts of the valley at 15′ to 60′ in depth, but between the railway and Sacramento River it is generally alkaline; to procure good water it is necessary to penetrate deeper strata. No important irrigation is carried on, but the county possesses natural advantages for it. See our Xth Report, p. 179.

Central Irrigation District Canal.—See Glenn County. When completed this canal will irrigate a vast area in the valley region.

Contra Costa County.

The valley lands of this county are generally well supplied with subterranean water, and good wells are 20′ to 50′ deep, and furnish a large supply by pumping. A narrow artesian belt, about 1½ miles long, lies immediately east of Concord. There are eight wells in it, which are 50′ to 100′ deep, and each flows a fair-sized stream. The strata penetrated are blue and yellow clays.

El Dorado County.

California Water and Mining Co.—The company take their winter's supply of water from Pilot Creek and its tributaries, but in summer also from Little South Fork of American River, Loon Lake, Pleasant Lake, Bixby Lake, and the natural outflow of these lakes, known as Girly Creek. The altitude at Loon Lake is 6,200′. The main canal consists of 7 miles of the bed of Girly Creek, followed by 11 miles of ditch, largely flume, of the following dimensions: 4½′x 30″ on a grade of 16′ to the mile, carrying 1,000 miner's inches; thence dropping into and flowing down Pilot Creek 11 miles to a point where the trunk-line commences; thence from the Pilot Creek reservoir 28 miles to Georgetown; portions of the line consist of parallel ditches, with a grade of 16′ to the mile and a capacity of 800 miner's inches, delivered at Georgetown at an elevation of 2,800′. From Georgetown, branch ditches supply the surrounding country; one extends to Greenwood, a distance of 8 miles, carrying 750 miner's inches of water, and from thence to Mammoth Bar Junction, a further length of 5 miles. From this point it is carried to Wild Goose Flat, on the North Fork of the American River, by way of Pilot Hill, a distance of 20 miles; the capacity of this last branch is 200 miner's inches, and of 400′ elevation at the discharge point. Besides the main line, the El Dorado branch ditch starts from Pilot Creek at the mouth of Mutton Cañon and connects with the main ditch 7 miles E. of Georgetown; this branch is 20 miles long, has a grade of 16′ to the mile, and a capacity of 300 miner's inches. The company has another line, which takes the water from Rock Cañon and delivers it at Kelsey, and is 15 miles long and has a capacity of about 200 miner's inches. Six ditch-tenders and two office-men are employed. California Water and Mining Co., owner; C. M. Fitzgerald, of Georgetown, manager.

Daggett (*Fairchild*) *Ditch.*—It has the right to 5,000 miner's inches of the waters of Rubicon River, or the South Fork of the Middle Fork of the American River, together with the waters of the South Fork of Pilot Creek. The first section is constructed from Volcanoville, on the Mount Gregory ridge, to Pilot Creek, a distance of 22 miles, with lateral ditches of about 3 miles. It is 6′ on top, 4′ on bottom, and 3′ deep, with a grade of 9.6′ per mile and capacity of 3,000 miner's inches. At Volcanoville there is a fine reservoir. The flumes, etc., have lately been reconstructed. Its elevation of about 3,000′ removes all liability to obstruction from snows, while securing the benefit of the entire watershed on both sides of the river; it is also sufficiently high to cover all the available auriferous gravel on the Georgetown Divide. The remaining surveyed section to be constructed is 26 miles in length, and at the point of diversion on the Rubicon there is a steady flow at the lowest stage of 2,000 miner's inches, and for ten months in the year a superabundance of water, with a number of available reservoir sites. The Mount Gregory ridge, opposite Michigan Bluff, is yet in a comparatively virgin state, and without doubt carries a large area of pay-gravel. At present the ditch is supplying water to the Channel Bar Mining Co., and also to the Two Channel Mining Co., of Kentucky Flat. Hon. John Daggett, of Black Bear, Siskiyou County, owner; William J. Readshaw, of Georgetown, superintendent.

Diamond Ridge Ditch Co.—This system of ditches covers an area of country in El Dorado and Sacramento counties approximately 60 miles E. and W., with an average width of 12 miles N. and S., at elevations from 300′ to 4,100′ above the sea. The summer supply of water is diverted by three main lines, with capacities of 1,000 to 1,500 miner's inches, from the North Fork of the Cosumnes River and its branches, Camp and Park creeks. The winter supply is drawn from Carson, Clear, Deer, Indian, Ringgold, Slate, Squaw, Weber, and other smaller creeks.

The High Service line, of 1,200 to 1,500 miner's inches capacity, begins at the Baltic mill, 24 miles E. of Diamond Springs, on Camp Creek; thence 6¼ miles to Hazel Valley, dropping 650′ into Park Creek; thence down Park Creek, through Hazel Valley and Sly Park reservoir sites, 2 miles; thence 5½ miles to the Dry Gulch hydraulic mine. Here the water is either dropped into Camp Creek for the Low Service line, described later, or down Dry Gulch 1 mile to Clear Creek; thence 15 miles by the Middle Service line to Pleasant Valley, Newtown, Fort Jim, Tennessee Hill, and Red Hill, where it may be dropped into Ringgold Creek, down which it flows 3 miles; thence 5 miles to Diamond Springs. From Red Hill a branch line of 150 inches capacity extends 3 miles northward to Brooke's Hill. Also, from Ringgold Creek the Sherry branch of 120 inches capacity courses 3 miles northward to Weber Creek.

The Middle Service line, from Squaw and Clear creeks eastward, is in temporary disuse.

The Low Service line diverts water from the North Fork of the Cosumnes River, at the mouth of the Steeley Fork, 3 miles W. of Grizzly Flat, and conveys it 11 miles to Camp Creek; thence 9 miles to Clear Creek; thence 7 miles to the Cascade Falls, where it divides, one portion being carried 2 miles by the Connecting line to the Middle

Service line; thence 4 miles to Baker's Hill, where it is dropped 300′ into Ringgold Creek and picked up by the High Service line, previously described. The other portion is dropped into and flows down Squaw Creek 2 miles; thence 6 miles to Diamond Springs, where both systems unite. This ditch is 8′ wide on top, 6′ on the bottom, 2′ deep, with a grade of 4′ per mile, and a capacity of 1,000 miner's inches.

The water flows around on the north and south sides of Diamond Hill in three ditches at different elevations. The South Diamond line feeds the two Waldo branch ditches and reservoirs, which supply the country south of Diamond Springs; their capacity is 120 inches each. At the west end of Diamond Hill the following branches, with capacities of 100 to 200 inches, radiate, and supply the country north and northwest, viz.: Gold Hill, Missouri Flat, Missouri Flat "loop," South Sugar Loaf, and North Sugar Loaf to Indian Creek; thence 6 miles by the mud line to the Lone Tree reservoir; thence by smaller branches to Grapevine, Mound Springs, Red Crevasse, Shirley Flat, Tennessee, etc.

The main line drops down a ravine at the west end of Diamond Hill, and flows to the three "equalizing" reservoirs between Diamond Springs and Mud Springs, where the following branch lines, of 100 to 400 inches capacity, diverge, viz.: Loafer's Hollow, 6 miles to Aurum City, etc.; Logtown, 4 miles; Lower Empire; Lower Logtown, 13 miles to Hermitage, etc. The main line leaves the reservoirs and flows 3 miles down Empire and Slate creeks to the falls of Slate Creek, where the Rock branch starts on the north side and runs 3 miles northward. The main line is diverted on the opposite side and continues via Buckeye Flat, Shingle Springs, Green Valley, etc., 16 miles to the American reservoir, of 200 acres, at 1,400′ altitude. At Buckeye one branch goes north to Tennessee and Pyramid; the other goes south, through Sawmill Ravine, to Frenchtown, thence 3 miles by ditch to Pekin, Oro Fino, etc. Several miles east of the American reservoir the water may be dropped into Deer Creek and picked up 5 miles lower down, near Cothrin's, and diverted by a branch extending 12 miles to the Deady reservoir, and thence to the Western House, 18 miles from Sacramento City. Near White Rock this line divides, and the other branch sweeps around the hills to Willow Springs, near Folsom. This latter branch may also be fed from the American reservoir by dropping the water down Carson Creek. From the same reservoir small branches run to Clarkesville, Marble Valley, Mormon Tavern, Plunkett, Saccarap, and Sweetwater. The total length of the surveyed lines is 314 miles; that part in operation just at present is about 170 miles. Peter Watt, of Placerville, superintendent.

Douglas Ditch.—See Empire.

El Dorado Water and Deep Gravel Mining Co.—This company takes water from the American River, at Cedar Rock, at 3,500′ elevation, 40 miles E. of Placerville. The main canal is 40 miles long, 16′ wide on top, 4′ on the bottom, 6′ deep, and with a grade of 4′ to the mile. When in good condition the capacity is 5,000 miner's inches. An old ditch, at a lower elevation, owned by the company, is abandoned. The branches, ten in all, extend to Gold Hill, El Dorado, South Flat, etc. The Weber ditch is 10 miles in length; South Fork, 16 miles long, 5′ broad, and 3′ deep; the Missouri Flat ditch is 10 miles long, 4′ on top, 2′ on bottom, and 2′ deep. The charges for water are: For sluicing, 10 cents per inch per day; for power, 15 cents per inch; for hydraulic, 6 cents per inch, and for irrigation, 10 cents per inch, all for twelve hours. The company owns 260 acres of hydraulic mining ground on Spanish Hill, Chile Ravine, etc. Eleven ditch-men are employed. El Dorado Water and Deep Gravel Mining Co., owner. (See Placerville Gold Quartz Mining Co.) A. D. Henderson, of Placerville, superintendent.

Empire (*Douglas*, *Plymouth*) *Ditch.*—It has its head on Middle Fork of the Cosumnes River, 4 miles above Pi-pi Valley, at 3,600′ altitude. The main canal is 26 miles long, 4′ wide, 3′ deep, and has 16′ to 1 mile grade, with 1,500 miner's inches capacity; the lateral branches extending to Cedarville, Fairplay, Bridgeport, and Bean Hill, and have all a grade of 16′ to 1 mile. The *Bridgeport branch*, at an elevation of 1,400′, is 12 miles long, 2′ wide, 18″ deep, with a capacity of 800 miner's inches. The *Fairplay branch* is 7 miles long, 3′ wide, 2′ deep, and 500 miner's inches capacity. The *Cedarville branch* is 6 miles long, 2′ wide, 18″ deep, and carries 200 miner's inches. The *Bean Hill* has a length of 6 miles, is 2′ wide, 18″ deep, and carries 300 miner's inches. The charge for water is 8 cents per inch for twenty-four hours, for both mining and irrigating. Four ditch-tenders are employed. A. Hayward and Hobart Estate, of San Francisco, owners; J. Crane, of Plymouth, Amador County, superintendent.

Natoma Ditch.—It is 12 miles long, taking water from American River, at the head of Salmon Falls. The ditch is 10′ wide on top, 6′ on the bottom, and 2½′ deep, having a grade of 4′ per mile. The water is conveyed to Sacramento County, where it is used in irrigating orchards and vineyards and in the gravel mines near Folsom. C. H. Schussler, of Folsom, superintendent.

Fresno County.

Artesian Well Belt.—The flowing wells are limited in number, and confined to a belt running northwesterly through the lower lands of the San Joaquin Valley, at 160′ to 225′ altitude. An abundant supply of water may be procured east of this belt, if pumping is resorted to. Good water for any purpose is very limited on the western side of the valley.

Browning's, P., Well.—It is in Sec. 17, T. 17 S., R. 19 E., at about 210′ altitude. It is 8″ in diameter, 700′ deep, and flows 5½″ over the casing. Used for stock water. The strata penetrated are alternating horizontal layers of clay and sand; hard, impervious clay overlies the water-bearing sand.

Burrell's, Mrs., Well.—It is in Sec. 2, T. 17 S., R. 18 E., at about 210′ altitude. It is 6″ in diameter, 650′ deep, and flows 5½″ over the casing. Alternating beds of sand and clay were penetrated, and 150′ of blue clay is said to overlie the water-bearing sand.

Enterprise Canal Co.'s Canal.—It is N. and N.E. of Fresno, and diverts water from Kings River. It is 30 miles long, 25′ on top, 15′ on bottom, 2½′ deep, with a grade of 1½′ to 3′ per mile, and a capacity of 100 cu. ft. per second. W. H. Ingels, of Fresno, secretary; F. M. Chittenden, of Fresno, superintendent.

Fresno Canal and Irrigation Co.'s Canal.—It diverts water from Kings River, 25 miles E. of Fresno, by a low, temporary wing-dam, and extends westward 50 miles. It is 80′ wide on top, 60′ on bottom, 6′ deep, and the grade varies from 1½′ to 5′ per mile; the capacity is 1,000 cu. ft. per second. The distribution system has a total length of about 450 miles and covers about 160,000 acres in its district; about one half is now irrigated. W. H. Ingels, of Fresno, secretary; F. M. Chittenden, of Fresno, superintendent.

Fresno City's Wells.—These eight wells in Fresno are at about 310′ altitude. They are 10″ and 12″ in diameter, 250′ to 680′ deep, and the water rises to within 15′ of the surface. They yield 3,000,000 gals. daily by pumping, without affecting the supply perceptibly. The maximum capacity of the 75 H.P. double-action Holly plant is 4,000,000 gals. daily. Crude petroleum from Santa Paula is used for fuel. It is stated that electricity will shortly be substituted for the motive power. The water is used for domestic and other purposes, under about 110′ pressure, from the tank of 250,000 gals. capacity. The strata penetrated are alternating clay and sand. The following analysis is by Howard Stillman, Engineer of Tests, S. P. R. R. Co., at Sacramento:

	Grains per U. S. Gallon.
Calcium carbonate ($CaCO_3$)	3.55
Magnesium carbonate ($MgCO_3$)	1.57
Magnesium sulphate ($MgSO_4$)	0.41
Magnesium di-chloride ($MgCl_2$)	1.66
Silica (SiO_2)	2.74
Sesquioxide of aluminum and iron ($Al_2Fe_2O_3$)	0.06
Alkali silicates	3.79
Organic matter	0.87
Total	14.65

Heminghaus', G., Wells.—Well No. 1 is at the residence, 3 miles E. of Mendota, at about 200′ altitude. It is 8″ in diameter, 740′ deep, flows 500,000 gals. daily, and the water is used for domestic and irrigation purposes. The upper bed of water-bearing sand is 500′ below the surface, below which four similar strata were penetrated, and which are separated by clay. Well No. 2 is 5 miles E. of No. 1, on the south side of the San Joaquin River. It is 7″ in diameter, 1,150′ deep, and flows 4½″ over the casing; water too brackish to use. The strata penetrated are—

Alluvial sediment	25′
Red sandy clay, containing small gravel	1,000′
Compact clay	100′
Water-bearing sand	25′
Total	1,150′

James', J. G., Wells.—There are six flowing wells on the "Fish Slough ranch," five of which are on the east and one on the west side of the slough. They are 7″ and 8″ in diameter, 600′ to 700′ deep, and flow 1″ to 10″ over the casings. One at the ranch-house furnishes water for domestic purposes; the others for stock. The water is all more or less mineralized; sulphur is the most apparent. That on the west side of the slough penetrates principally fine alluvial sediment, flows 1″ over the casing, and is on the border of the "artesian belt." Red and blue clay, with thin layers of sand, are penetrated by the wells on the east side.

James' Canal.—It diverts water from the west side of Fresno Slough, and courses N.W. It is 7 miles long, 90′ on top, 80′ on bottom, 2′ deep, and irrigates 10,000 acres. J. G. James, of San Francisco, owner.

John's, A. S., Wells.—There are two, in Sec. 21, T. 17 S., R. 19 E. They are 8″ in diameter, 600′ and 900′ deep, flow 3″ and 5″ over the casing, and are used for watering stock. They penetrate sandy clay and sand, with a thin stratum of "hardpan" overlying the water-bearing sand.

Miramonte Colony's Artesian Well, Kern County.

Heminghaus' Artesian Well, Fresno County

Kings River and Fresno Canal Co.'s Canal.—It diverts water from Kings River about 25 miles E. of Fresno, and courses westward. It is 20 miles long, 35′ wide on top, 25′ on the bottom, and 3′ deep, with a capacity of 300 cu. ft. per second. W. H. Ingels, of Fresno, secretary; F. M. Chittenden, of Fresno, superintendent.

Mendota Well.—It was bored by the S. P. Co. It is 6″ in diameter, 625′ deep, and flows 175,000 gals. daily. It is too strongly mineralized to use in the locomotive boilers, but is used for domestic and medicinal purposes. It penetrates sandy clay, and compact clay overlies water-bearing sand.

San Joaquin and Kings River Canal and Irrigation Co.'s Canal.—It diverts water from San Joaquin River at the mouth of Fresno Slough, 2 miles N. of Mendota, at 180′ altitude. It courses N.W. on the west side of San Joaquin River, to near Westly Station, in Stanislaus County. For 11 miles from its head it is a single canal, about 50′ wide and 9′ deep; thence it divides into two parallel canals, which unite at Los Baños Creek and form a single canal the remainder of the way. It is 77 miles long, 92′ wide on top, 80′ on bottom, 4′ deep, with a grade of 1½′ per mile, and irrigates 70,000 acres, from which the company receives remuneration, and the surplus water irrigates 150,000 acres of pasture land for the firm of Miller & Lux. C. R. Merritt, of No. 508 California Street, San Francisco, secretary; D. M. Rons, of Los Baños, superintendent.

Glenn County.

The eastern and central parts of the county possess many natural advantages for the farmer. The soil for the most part is strong, and the climate well suited for agriculture and horticulture. The entire valley lands possess an almost inexhaustible supply of subterranean water, and water for irrigation may be obtained from the streams. The foothills and valleys of the western part possess good grazing lands, and fruit is grown to some extent. Deposits of chromic iron, and traces of cinnabar, copper, and gold occur in the western part of the county, but no mining is carried on at present. A number of unimproved mineral springs exist among the hills.

Central Irrigation District's Canal.—This district was organized under the "Wright law" to include a large part of the valley lands of both Glenn and Colusa counties. The main canal, when completed, will be about 50 miles long, 65′ wide on top, 6′ deep, and with a grade of 5.82″ per mile. It will divert water from the Sacramento River at the N.E. corner of Glenn County, and course southward. The greater part of the excavation has been done, but work on it has ceased, pending litigation. P. Graham, of Williams, secretary.

Potter's, E. E. (Rideout), Well.—See our XIth Report and Bulletin No. 3, pp. 224 and 7. It is on the Rideout ranch, about 2 miles N. of Norman Station. It is 4″ in diameter at the top, 2″ at the bottom, 940′ deep, and flows a fair stream, said to be 6,000 gallons in twenty-four hours.

Stony Creek Canal.—It is in the northern part of the county, and recently completed. It is 18 miles long, 24′ wide on the bottom, 30′ on top, and 3½′ deep, with a grade of 12′ per mile. It diverts water from Stony Creek, about 12 miles W. of the railroad, courses eastward via Orland, and will irrigate about 20,000 acres. Glenn County Land and

Water Co., owner; N. K. Spect, of Willows, secretary; T. H. Dodson, of Orland, superintendent.

Wells in the Valley.—See our XIth Report, p. 225. A good supply of well water may be had in the valley, in the northern part of the county, from a gravel bed 10′ to 20′ below the surface. About Willows it is obtained from the second stratum of sand and gravel, at a depth of about 40′. About Maxwell and Germantown the second water-bearing stratum lies at a depth of about 100′. Surface water—that from the first stratum below the surface—is generally charged with alkali.

Kern County.

Kern River and Poso Creek afford water for irrigating a vast area in the valley, principally west of the S. P. R. R. Numerous canals divert water from it, all of which are controlled by the Kern County Land Co. The surplus water flows into Buena Vista Lake, which serves as a temporary reservoir for the Kern Valley Water Co., whose canals distribute it to 25,000 to 30,000 acres in a broad belt north and northwestward. Those given in the following table are owned or controlled by the Kern County Land Co., except the Kern Valley Water Co.'s Canal, which is owned by the firm of Miller & Lux.

CANALS ON THE NORTH SIDE OF KERN RIVER.

Name of Canal.	When Located.	Length, in Miles	Quantity of Water.		Width on Bottom	Depth of Water	Grade per Mile
			Miner's Inches	Cu. ft. per Sec.			
Beardsley	Dec., 1873	8	47,230	944	40′	4′	1.0′
Calloway	May, 1875	32	74,000	1,476	80′	5′	0.8′
Edwards	Dec., 1874	2	1,440	29	6′	1′	1.5′
Emery	Dec., 1876	3	2,000	40	6′	2′	1.5′
Goose Lake	July, 1875	4½	90,000	1,800	140′	3′	2.0′
James Dixon	April, 1875	3	14,000	280	40′	3′	2.0′
Johnson	June, 1873	4	8,640	172	30′	3′	1.5′
Joice	June, 1875	4	6,250	125	10′	2′	2.0′
Jones Tuckey	June, 1876	4	1,000	20	4′	2′	1.5′
McCaffrey	Oct., 1874	3	1,296	26	10′	2′	1.5′
McCord	Mar., 1875	14½	5,000	100	30′	3′	1.5′
Pioneer	Apr., 1873	11½	20,074	400	40′	3′	2.0′
Railroad	July, 1874	⅗	31,075	624	40′	3′	2.0′
Wible	May, 1875	⅕	5,040	100	40′	3′	2.0′

CANALS ON THE SOUTH SIDE OF KERN RIVER.

Anderson	Oct., 1872	4	5,057	101	20′	2′	1.5′
Buena Vista	July, 1870	13½	14,000	279	30′	3′	2.0′
Castro	----------	5	1,000	20	16′	18″	2.0′
Farmers	April, 1873	19¾	14,400	288	30′	3′	2.0′
Frazer	April, 1873	2¼	2,600	52	--------	--------	--------
Gates	Oct., 1878	2½	5,057	101	12′	2′	1.5′
Henley	Jan., 1874	2½	2,880	57	--------	--------	--------
James	Oct., 1871	17¼	19,730	394	40′	3′	2.0′
Kern Island	------ 1870	30	20,000	400	40′	4′	2.0′
Kern Valley Water Co.	April, 1877	40	130,000	2,594	125′	10′	0.9′
Meacham	April, 1873	4	1,500	30	12′	2′	1.5′
Old S. Fork	----------	3	3,800	75	20′	2′	5.0′
Plunket	Dec., 1872	3¾	5,057	101	12′	2′	1.5′
Stine	Dec., 1872	47½	55,980	1,117	30′	3′	2.0′
Wilson	Aug., 1874	2½	500	10	4′	2′	1.5′

There are numerous artesian wells in a belt 15 to 20 miles wide in the northern central part of San Joaquin Valley, west of the S. P. R. R. They are yet too thinly distributed in the southern part to delineate definitely the limit of their possible area. The strongest flowing wells are in Tps. 25 and 26 S., R. 22, 23, and 24 E. The better ones are said to flow 1,000,000 to 2,500,000 gals. daily, but farther south the flow decreases as the limit of the area is approached. The waters are all more or less mineralized, and their temperature is generally 65° to 75° F. In a few cases calcium carbonate has crystallized out of the water on the inside of the casings, and diminished the flow. The decrease in flow of many of the older wells is probably due to this cause. It is said that no immediate decrease in flow has been noted by increasing the number of wells, which is unusual in artesian areas. The wells in this area, principally 8″ diameter, though in a few cases larger, are 225′ to 600′ deep. They penetrate five to fifteen strata of impervious clay, varying in thickness and character, lying almost horizontally, and separated by thin beds of water-bearing sand and gravel. The wells are cased with heavy sheet iron to the bottom, which is perforated at each water-bearing stratum, and the total flow obtained. Unfortunately samples of the various strata have not been preserved, with records of their thickness and depth, which would throw much light upon the structure of the area. Along the western boundary of the valley, water is very limited in quantity, strongly alkaline, and no artesian wells occur, though deep ones have been bored. The following analyses of waters from this county are by Howard Stillman, Engineer of Tests, S. P. R. R. Co., of Sacramento:

Bakersfield Well (230′ deep).

	Grains per U. S. Gallon.
Calcium carbonate ($CaCO_3$)	4.95
Calcium sulphate ($CaSO_4$)	0.70
Silica (SiO_2)	3.73
Sesquioxide of alumina and iron ($Al_2Fe_2O_3$)	0.76
Sodium sulphate ($NaSO_4$)	1.92
Sodium chloride ($NaCl$)	1.87
Total	13.93

Kern City Artesian Well.

	Grains per U. S. Gallon.
Calcium carbonate ($CaCO_3$)	3.44
Calcium sulphate ($CaSO_4$)	0.29
Magnesium carbonate ($MgCO_3$)	0.29
Magnesium sulphate ($MgSO_4$)	0.35
Silica (SiO_2)	0.99
Sesquioxide of alumina and iron ($Al_2Fe_2O_3$)	0.07
Sodium sulphate ($NaSO_4$)	0.87
Sodium chloride ($NaCl$)	1.16
Alkali silicates	2.57
Total	10.03

Lo Kern Artesian Well (7″ in diameter, 700′ deep).

	Grains per U. S. Gallon.	After One Week.
Calcium carbonate ($CaCO_3$)	0.58	1.22
Calcium sulphate ($CaSO_4$)	6.00	4.08
Calcium di-chloride ($CaCl_2$)	1.74	1.28
Magnesium carbonate ($MgCO_3$)	0.41	----
Silica (SiO_2)	0.76	1.10
Sodium chloride ($NaCl$)	27.51	23.84
Organic matter	1.40	----
Totals	38.40	31.52

Kings County.

It lies west of Tulare County, and consists principally of valley lands, but includes a small area of foothills of the Coast Range. Stock-raising, horticulture, and agriculture are important industries. More than 100,000 acres are said to be under irrigation, which can be considerably increased. Artesian wells are numerous in the western part and afford a large amount of water for domestic, stock, and irrigation purposes. Wheat-growing in the eastern part of the county is being rapidly replaced by fruit and vegetables where water is available for irrigation. Mineral industries are necessarily of minor importance. The bituminous formation occurs in the western part of the county, but is undeveloped. See our Bulletin No. 3, p. 53.

There are numerous artesian wells in the eastern part of this county in a belt extending west to Lemoore and the western part of Tulare Lake, at 220′ to 280′ altitude. They afford a vast quantity of water for domestic, irrigation, and stock purposes. They are 7″ to 9″ in diameter, and flow ½″ to 5″ over the casing. The greater part of the flowing water is obtained from two or more thin strata of gravel and sand, 450′ to 760′ deep. A well at Artesia Hotel, in Hanford, is said to be 1,300′ deep, but no flowing water was obtained below 760′. The water-bearing gravels are overlaid by from 100′ to 150′ of impervious blue clay, which is overlaid by strata of clay and sands in alternating layers, varying in character, thickness, and extent. There are five important irrigation districts in the county, which divert water from Kings River and Cross Creek.

Lakeside Ditch Co.'s Canal.—It diverts water from Cross Creek in Sec. 24, T. 19 S., R. 22 E., runs southwesterly, and is 50′ wide on top, 30′ on bottom, 3′ deep, with a grade of 2′ per mile, and capacity of 302 cu. ft. per second. There are 3 miles of trunk and 20 miles of branch lines. It covers about 40,000 acres, and 25,000 are now irrigated. S. Manasse, of Hanford, secretary.

Last Chance Ditch Co.'s Canal.—It diverts water from Kings River, in Sec. 26, T. 17 S., R. 21 E., and runs westerly. The main canal is 6 miles long, 30′ wide on top, 25′ on bottom, 5′ deep, with a grade of 1′ to 2′ per mile, and a capacity of 250 to 300 cu. ft. per second. It irrigates 15,000 to 20,000 acres. John Worswick, of Armona, secretary.

Lower Kings River Ditch and Water Co.'s Canal.—It diverts water from Kings River below the Last Chance ditch, and runs in a southerly direction. The main canal is 7 miles long, 30′ wide on top, and 25′ on bottom, 4′ deep, with a capacity of 250 cu. ft. per second. It is said to irrigate 20,000 acres. S. McGlothen, of Lemoore, secretary.

People's Ditch Co.'s Canal.—It diverts water from Kings River in Sec. 1, T. 17 S., R. 22 E., and runs southwesterly. The main canal is 8 miles long, 30′ wide on top, 25′ on bottom, 5′ deep, with a grade of 1′ to 2′ per mile, and a capacity of 300 cu. ft. per second. It is said to irrigate 20,000 acres. W. R. McQuiddy, of Hanford, secretary.

Riverside Ditch Co.'s Canal.—It diverts water from Kings River, about 6 miles N. of Hanford, and is said to irrigate about 20,000 acres. L. C. Lens, of Hanford, secretary.

Los Angeles County.

Alamitos Land Co.—Its irrigation pipe-line system is situated near Long Beach. The water is obtained from artesian wells. W. F. Sweeney, of No. 306 E. First Street, Los Angeles, secretary.

Alpine Springs Land and Water Co.—Its irrigation system is situated near Alpine, and diverts water from Little Rock Creek. The canal is 9 miles long, 7½′ wide on top and 5′ deep, with a grade of 200′ to 316′ per mile; capacity, 12,500 miner's inches. G. T. Cole, of No. 136 S. Broadway, Los Angeles, secretary.

Azusa Land and Water Co.—Water is diverted from San Gabriel River, and used for irrigation near Azusa. The canal is 5 miles long, 7′ wide on top and 5′ deep, with a grade of 10′ to 12′ per mile; capacity, 3,500 miner's inches. M. Albee, of No. 57 Bryson Block, Los Angeles, secretary.

Barton Land and Water Co.—Its irrigation system is situated near Sunnyside, and includes the two following systems: The old *Mill Creek* "zanja," which is 6 miles long, and the *Sunnyside* ditch, also 6 miles long, together with 25 miles of pipe. Total capacity is 600 miner's inches. The old zanja diverts water from Mill Creek and the Sunnyside from the Santa Ana River. C. Lautz, of No. 207 Bradbury Block, Los Angeles, secretary.

Bouton Water Co.—Water is obtained from two artesian wells, 340′ and 372′ deep, and the irrigation system is situated 4 miles N. of Long Beach, and has a capacity of 220 miner's inches; 16,410′ of 15″ pipe and 30,000′ of 4″ pipe are used. The grade is undulating, and at one point pressure has to be used to overcome a rise of 6′; after that the grade is 42″ in 1,800′. Gen. E. Bouton, of No. 121 S. Broadway, Los Angeles, president.

Columbia Colonization Co.—Its irrigation system is situated near Victor, San Bernardino County, but extends into Los Angeles County. The canal is 46 miles long, 80′ wide on top, 40′ on bottom, and 10′ deep, with a grade of 4.4′ per mile; capacity, 60,000 miner's inches. The water is diverted from Mojave River at Upper Narrows, near Victor. J. W. Wilson, of No. 318 Stimson Block, Los Angeles, secretary.

Crystal Springs Land and Water Co.—This company supplies the water used by the Los Angeles City Water Co. Its main line consists of about 5 miles of 44″ pipe and conduit, with a capacity of about 20,000,000 gals. per day. The water is derived from water-bearing strata on the Los Feliz ranch, in the San Fernando Valley. The method of obtaining it is as follows: Sewer pipes are laid in the water-bearing formation, at a depth of 12′ to 20′, and loosely fitted together; the bells of the joints being turned toward the subterranean flow. By this means the water forces its way through the joints and into the pipes, but it does not carry sand with it. This company also diverts water from the Arroyo Seco, at a point about 3 miles N.E. of Los Angeles. The water from the last-mentioned source is conveyed to Los Angeles by a pipe-line with a capacity of 100 miner's inches. S. H. Mott, of No. 303 New High Street, Los Angeles, secretary.

Gardena Water Supply Co.—Its irrigation pipe-line system is situated 5 miles N.E. of Redondo, and the water is obtained from artesian wells. G. Pomeroy, of No. 105 Broadway, secretary.

Laguna Irrigation Co.—Its system is near Los Angeles. The canal is 3 miles long, 4′ wide on top, 4′ on bottom, and 2′ deep; capacity, 195 miner's inches. The water is obtained from lagoons and artesian wells. G. Pomeroy, No. 105 S. Broadway, secretary.

Loma Vista Ranch Co.—Its irrigation system is situated near Howard Summit, and consists of 10 miles of pipe and open ditches. The water is diverted from Los Angeles sewers. W. W. Howard, of No. 304 W. First Street, secretary.

Los Angeles City Water Co.—This company distributes the water supplied by the Crystal Springs Water Co. through about 2,000,000′ of pipe and conduit in the City of Los Angeles. This company also diverts water, for power purposes, from the Los Angeles River at a point about 7 miles N. of Los Angeles. A canal of 6 miles in length conducts the water to power stations, where the power is used for pumping a portion of the water supplied by the Crystal Springs Co. The water diverted from the Los Angeles River is returned to that stream in N. Los Angeles. S. H. Mott, of No. 209 Marchessault Street.

Marengo Water Co.—Its irrigation system is situated near Pasadena. The main line is 20″ wide, 20″ deep, and irrigates 40 acres. M. Albee, of No. 22 Burdick Block, Los Angeles, secretary.

Palmdale Irrigation Co.—Its irrigation system is situated near Palmdale. The canal is 8 miles long, 8′ wide on top, 5′ on bottom, and 3′ deep, with a grade of 7½′ per mile. Its capacity is 980 miner's inches. The water is diverted from Little Rock Creek. C. W. Denhoff, of No. 118½ S. Broadway, Los Angeles, secretary.

Porter Land and Water Co.—This irrigation system is situated in San Fernando Valley. Twenty-six miles of pipe are used. The water is diverted from San Fernando Creek, and also obtained in part from artesian wells. J. B. Threlkeld, of No. 3 California Bank Building, Los Angeles, secretary.

Puente Land and Water Co.—Its irrigation system is situated in the San Gabriel Valley, and the main canal is 3 miles long, 3′ wide, and 2′ deep. Also 25,000′ of 10″ pipe is used. The capacity of main canal is 200 miner's inches. The water is diverted from San José Creek. G. Pomeroy, of No. 105 S. Broadway, Los Angeles, secretary.

San Gabriel Valley Land and Water Co.—This irrigation system is situated in San Gabriel Valley, and the main canal is 4 miles long, besides 2,000′ of tunnels. Its capacity is 50 miner's inches. The water is obtained from artesian wells. E. K. Alexander, of No. 145 S. Broadway, Los Angeles, secretary.

San José Ranch Co.—Its irrigation system is situated near San Dimas. The main line is 41 miles of 12″ and 14″ pipe. The capacity is 84 miner's inches. The water is obtained from fifteen artesian wells. M. L. Wicks, Jr., of No. 118 S. Main Street, Los Angeles, secretary.

Sierra Bonita Colonies are situated near Palmdale. Their canal is 2 miles long, 7′ wide on top, 5′ on bottom, and 1½′ deep, with a grade of 16′ per mile, and capacity of 900 miner's inches. The water is diverted from Little Rock Creek. A. A. Lawson, of No. 136 S. Broadway, Los Angeles, secretary.

Madera County.

The area in which flowing wells occur is in the western part of the county, and extends eastward to within 2 to 3 miles of the S. P. R. R. At Madera the water rises within 5′ of the surface, and cannot be exhausted by pumping.

Bliss Ranch.—It is E. of the railroad, in the northern part of the county, and joins the California Pastoral and Agricultural Co.'s ranch. There are twelve artesian wells on the ranch, 6″ to 10″ in diameter, 175′ to 400′ deep, which flow 15,000 to 200,000 gals. daily. The water is principally used for stock. The strata penetrated are alternating heavy beds of clay and thin layers of sand and gravel, irregular in character and in quantity of water furnished. George Bliss, of San Francisco, owner.

California Pastoral and Agricultural Co.'s Wells.—The ranch is in the northwestern part of the county, at 100′ to 150′ altitude. There are fourteen flowing wells, 7″ in diameter, 175′ to 314′ deep, which flow 7,500 to 275,000 gals. daily; water used principally for stock. The following strata were penetrated by one well, which is typical of the region:

Soil	2′
Fine sand with streaks of clay	98′
Hardpan	0′ 6″
Sand	95′ 6″
Blue clay	100′
Water-bearing sand and gravel.	

Isaac Bird, Jr., of Merced, superintendent.

Chowchilla Canal.—It diverts water from San Joaquin River, 3 miles above the mouth of Fresno Slough, and runs northwesterly across the county. It is about 26 miles long, 40′ wide on top, 30′ on bottom, 2′ to 4′ deep, and with 1′ to 6′ grade per mile. The water is used for irrigating alfalfa, grazing lands, and for watering stock. California Pastoral and Agricultural Co., Miller & Lux, owners.

Madera Canal and Irrigation Co.'s Canal.—It diverts water on the east side of the great valley from the Fresno, Merced, and San Joaquin rivers. The main canal is 22 miles long, 40′ wide on top, 20′ on bottom, 4′ deep, and with a grade of 4″ per mile. It irrigates 8,000 to 18,000 acres per year, and by increasing the storage capacity, 100,000 acres could be irrigated. D. C. Bates, Nevada Bank, secretary; J. A. Hutton, of Madera, superintendent.

Miller & Lux Wells.—Their ranch is in the western part of the county and south of the California Pastoral Co.'s. The wells are 7″ in diameter, 1,260′ to 1,300′ deep, and furnish a vast quantity of water for stock purposes.

Rightmire's, Mrs., Well.—It is in Sec. 11, T. 10 S., R. 13 E., at the northern boundary of the county. It is 8″ in diameter, 300′ deep, flows about 700,000 gals. daily, and is used for domestic, irrigation, and stock purposes.

Merced County.

Artesian Belt.—See our Xth Report, p. 324. It runs N.W. and S.E. through the county, extends eastward to within 1½ to 4 miles of the S. P. R. R. and, westward approximately to the San Joaquin and Kings River Canal. There are 100 or more flowing wells in the county, furnishing a large quantity of water for stock, irrigation, and domestic purposes. All the artesian water is slightly mineralized, and in a few wells near the San Joaquin River it is brackish. Practically an inexhaustible supply of water may be had from pumped wells in the valley east of the artesian belt, and rises more or less above the water-bearing strata. As the foothills are approached eastward the strata are more porous and variable, and the water more confined to channels.

Bowman's, Cylas, Wells.—They are in Sec. 4, T. 9 S., R. 13 E., 12 miles S.W. of Merced, at 120′ altitude. Four are 7″ in diameter, 250′ to 385′ deep, and flow ¼″ to 1″ over the casings. One is 9″ in diameter, 697′ deep, flows 1½″ over the casing, and irrigates 20 acres of alfalfa. The strata penetrated are alternate layers of clay, sandy clay, sand, and gravel. A 70′ bed of impervious blue clay was struck at 180′, overlaid by sand and underlaid by sand and sandy clay. Numerous other wells in that locality are very like these.

Crew's, Wm., Well.—It is in Sec. 27, T. 6 S., R. 9 E., at about 90′ altitude. It is 7″ in diameter, 320′ deep, and said to flow 350,000 gals. daily. It is the strongest flowing well in the county, north of Merced River. The strata penetrated are alternating beds of clay and sand.

The Crocker and Huffman Land and Water Co.'s Canal.—See our Xth Report, p. 329. It diverts water from Merced River 3 miles above Snelling, and is 21 miles long, 100′ wide on top, 60′ on the bottom, 4½′ deep, with a grade of 1′ per mile, and of 1,200 cu. ft. per second capacity. The main line ends at Yosemite Lake, which serves as a storage reservoir, and is about 500 acres in area, and 60′ deep at the embankment. The water is used for irrigation, and is also piped from the reservoir to Merced for municipal supply. About 240,000 acres can be irrigated by this system, and 10,000 acres are now irrigated. J. D. Bradley, of Merced, secretary; Charles D. Martin, of Merced, superintendent.

Dos Palos Well.—It is at Dos Palos, on the southern boundary of the county, at about 120′ altitude. Is 6″ in diameter, said to be 500′ deep, and has a strong flow. The water is too highly mineralized to use in boilers. The well is said to penetrate alternating layers of clay and sand, and water flows from three strata, 300′, 350′, and 400′ deep, respectively.

Goldtree's (Galland) Well.—It is in Sec. 27, T. 8 S., R. 13 E., 6 miles S.E. of Merced. It is 10″ in diameter, about 650′ deep, and said to flow 350,000 gals. daily, which irrigates 40 acres of vines. The strata penetrated are alternating beds of clay and sand.

Hall's, W. W., Wells.—There are five in Sec. 22, T. 6 S., R. 9 E., 2 miles N. of Merced River and 1 mile E. of San Joaquin, 7″ in diameter, 318′ to 326′ deep, and each flows from 8,000 to 25,000 gals. daily; principally used for stock. The strata are sand to the blue clay, which overlies the water-bearing sand.

Hess', H. (Mull's), Wells.—There are eight flowing wells on the "Mull ranch," Sec. 24, T. 9 S., R. 13 E., 12 miles S. of Merced, at about 120′ altitude. Seven are 7″ and 8″ in diameter, average 300′ deep, and flow ¼″ to ½″ over the casings; one is 10″ diameter, 1,013′ deep, and said to flow 600,000 gals. or more daily. Flowing water is obtained in a number of strata 203′ to 680′ deep; the strongest from 660′ to 680′ deep, but no flowing water was obtained below 680′. The strata penetrated are alternating clay and sand.

Los Baños Station Well.—See our Xth Report, p. 325. It is 8″ diameter and 434′ deep. The water is said to be injurious to boilers, and is seldom used.

Los Baños Waterworks Well.—It is in Los Baños, 8″ diameter, 464′ deep, and flowed, when first completed, 85,000 gals. daily; 36,000 gals.

are pumped in nine hours, without decreasing the supply perceptibly. Used for municipal purposes. The strata penetrated are—

Surface soil	6′
Gravel	9′
Sandy clay	65′
Soft sandstone	4′
Soft clay	20′
Hard, light-colored dry clay	58′
Soft sandstone	5′
Yellow sandy clay	35′
Tough blue clay	237′
Sand and water	7′
Total	446′

Merced Falls Power and Manufacturing Co.—This company has constructed a dam, 315′ long, and 18′ high, across the Merced River at Merced Falls. It is estimated that 2,000 H.P. will be developed during the lowest stage of the river. It is the intention to install electric machinery for power and light, to be distributed to the surrounding county. Merced Falls Electric Power and Manufacturing Co., owner; John T. Fleming, of Alameda, superintendent.

Miller & Lux Wells.—There are six or more on the stock ranch on the San Joaquin River, one of which is on the west side. They are 6″ to 8″ diameter, 230′ to 300′ deep, and furnish considerable water for stock. They penetrate variable strata of clay and sand.

Mitchell (*J. W.*) *Estate Wells.*—The ranch is on Merced River, W. of the S. P. R. R. There are six flowing wells S. of the river and three N. of it, 7″ diameter, 350′ to 370′ deep, and flow $\frac{3}{4}$″ over the casing. The strata penetrated by the wells in the northern part are about 275′ of sand and sandy clay; 25′ to 60′ of impervious blue clay overlies the water-bearing gravels, but farther south the clay strata increase in number and thickness. The water from the wells south of the river is used for stock, irrigation, etc., but those north of the river are more or less brackish.

Newman's, S., Wells.—One well, 4 miles N. of Volta Station, is 8″ diameter, 386′ deep, and flows 450,000 gals. daily. One well near Ingomar is 8″ diameter, 370′ deep, and flows 50,000 gals. daily. The strata penetrated are clays and sand similar to those at Los Baños.

Ould's, E., Well (Artesian and Gas).—See our Bulletin No. 3, p. 20. It is 4 miles S.W. of Merced, 8″ diameter, 675′ deep, and flows $\frac{1}{2}$″ over the casing. It affords considerable natural gas, which has been utilized, but is now wasted. It is said the gas was struck at a depth of 654′.

Rodner's, John, Well.—It is in Sec. 16, T. 8 S., R. 13 E., 6 miles S.W. of Merced, at about 150′ altitude. It is 9″ diameter, 709′ deep, and flows 240,000 gals. daily; it is used for domestic and irrigation purposes. The following section of strata penetrated is furnished by the owner:

	Feet.
Black adobe	8
Yellow clay	4
Sand	13
Blue clay	2
Gray "slum"	73
Red clay	14
"Soapstone"	13
Blue clay	53
Water-bearing sand (first flow)	1
Blue clay	8
Sand	3
Yellow clay	6
Sand	4
Pink clay	10
Yellow clay	9
Soft sandstone (compact sand)	2
Loose sand	3
Yellow clay	12
Tough pink clay	11
Sand (bottom of 9″ casing)	2
Yellow clay	5
Gravel	12

	Feet.
Red clay	12
Gravel	1
Sand	1
Yellow clay	7
Soft sandstone	3
Red clay	14
Gravel	18
Hard yellow clay and granite bowlders	13
Hard gray soapstone with limestone bowlders	6
Sand	2
Red clay	5
Hard soapstone	29
Red clay	6
Sand	3
Soapstone	6
Red clay	9
Sand	2
Red clay	10
Sand (⅛″ flow)	12
Yellow clay	12
Sand	4
Blue clay	2
Sand (⅛″ flow)	7
Blue clay	7
Sandy clay	20
Sand	15
Blue clay	17
Gravel (⅔″ flow)	10
Hard blue clay	2
Sand (⅛″ flow)	7
Blue clay	9
Sand (⅛″ flow)	5
Blue sandy clay (bottom of 8″ casing)	15
Compact sand (½″ flow)	19
Blue clay	1
Sand (¼″ flow)	5
Blue clay	26
Sand (¼″ flow)	7
Blue clay	9
Sand ($\frac{1}{16}$″ flow)	3
Blue clay	18
Sand ($\frac{1}{16}$″ flow)	5
White clay	3
Blue clay	2
Sand ($\frac{1}{16}$″ flow)	4
Blue clay	7
Sand (⅓″ flow)	7
Blue clay (bottom of 7″ casing at 680′)	46
Sand	2
Blue clay	3
Sand	--

The casing was perforated at all the water-bearing strata when completed.

San Joaquin and Kings River Canal and Irrigation Co.'s Canal.—See our Xth Report, p. 329. See also Fresno County. It is on the west side of the San Joaquin River, and irrigates a belt running N.W. through the county.

Saunder's, J. J., Wells.—There are seven flowing wells on his ranch in Sec. —, T. 8 S., R. 12 E., 8 miles W. of Merced. They are 7″ diameter, about 230′ deep, and flow 40,000 to 200,000 gals. daily. Used for stock and domestic purposes. The strata penetrated are alternating beds of clay and sand of varied character.

Stephenson's, J. J., Wells.—There are eight flowing wells on his ranch on the east side of the San Joaquin River and at the mouth of the Merced River. They are 7″ diameter, 275′ to 340′ deep, and flow from 50,000 to 200,000 gals. daily; the water is used for stock and irrigation purposes. The strata are sand, with more or less sandy clay for about 275′; 25′ to 60′ of blue clay overlies the water-bearing gravels. It thins out as the eastern boundary of the artesian belt is approached.

Stephenson & Mitchell's (East Side) Canal.—See our Xth Report, p. 329. It diverts water on the east side of and from San Joaquin River, in Sec. 6, T. 9 S., R. 12 E., and courses northwesterly. It is 25 miles long, 45′ wide on top, 20′ on bottom, 3′ deep, with a grade of ½′ per mile. The water is used for irrigation.

Mono County.

Twin Lakes.—They are 10 miles S.W. from Bridgeport, at 7,500′ elevation, and lie near the eastern base of the Sierras. Each is about ½ mile long and wide, and are connected by a narrow channel ¼ mile long. The water therefrom flows into Robison Creek, which feeds several irrigating canals meandering through Bridgeport Valley.

Monterey County.

Flowing wells are only in the lowlands of the Salinas and Pajaro valleys west of Castroville. The water-bearing gravel beds extend almost throughout the Salinas Valley, however, and where penetrated by bored wells, 75′ to 130′ deep, the water generally rises considerably above the water-bearing strata, which are 10′ to 15′ below the surface, at Salinas; about 41′ at King City; and about 40′ N.E. of Castroville. They all afford a large quantity of water by pumping. The strata penetrated are principally thin beds of sand and gravel and heavy beds of impervious clays lying nearly horizontally.

Barden's, Charles, Well.—It is at Blanco, near the Salinas River. It is 114′ deep, 7″ diameter, and flows a 2″ stream. The strata penetrated are sand and clay.

Castroville Station Wells.—There are two; one of which is 10″ in diameter and 217′ deep; the other is 7″ and 196′ deep. The water rises to within 10′ of the surface. They afford a large quantity by pumping.

Clark's Well.—It is 1½ miles S. of Castroville. It is 5″ diameter, 125′ deep, and the flow is light.

Collins', James, Well.—It is 1 mile S. of Castroville. It is 5″ diameter, 146′ deep, and light flow.

King's, C. H., Well.—It is at King City, at 330′ altitude. It is 7″ diameter, 250′ deep, and the water rises to within 40′ of the surface. The strata penetrated are—

Soil and clay	45′
Gravel	3′
"Sticky sediment"	100′
Conglomerate	5′
Tough clay	15′
Sandy clay and sediment	75′
Gravel	7′
Total	250′

Murphy's, B., Well.—It is in Castroville. It is 7″ diameter, 78′ deep, and water rises to within 13′ of the surface.

Romie's, C., Wells.—These two wells are 1 mile W. of Soledad, and said to be 71′ and 91′ deep. The water-bearing stratum is sand, overlaid by clay. They afford a large quantity of water by pumping.

Salinas Deep Well.—See our Xth Report, p. 346. It is near the courthouse, Salinas, and said to be 1,300′ deep, penetrating clay, sand, and gravel. A record of the strata passed through to a depth of 777′ is given in our Xth Report. A flow of gas was struck, but too small to be used profitably.

Ulrey's Well.—It is in King City. It is 7″ diameter, 115′ deep, and the water rises to within 40′ of the surface; it is charged to some extent with minerals.

Nevada County.

Badger Hill Ditch.—It heads on south side of Wolf Creek, at the Maryland Mine, taking the waste water 1¼ miles to the Crown Point Mine. It is 4′ on top, 3′ on bottom, 3½′ deep, with a 6′ grade per mile, and of 800 inches capacity. The 14″ pipe-line is 400′ long and gives 80′ head.

Birdseye Creek Ditch.—It heads in Steep Hollow and extends to You Bet. It is 4′ on top, 3′ on bottom, and 3½′ deep, with a 14′ grade per mile.

Blue Tent Ditch.—It is on the Yuba River, at head of Bear Valley, near Fall Creek, and is 35 miles long, running first to Omega. It is 6′ on top, 5′ on bottom, and 4′ deep, with a 12′ grade per mile, and of 5,000 inches capacity. From Omega to Blue Tent it is 5′ on top, 4′ on bottom, and 4′ deep, with a 12′ grade per mile.

Cement Hill Ditch.—It heads on Rock Creek, 1½ miles above Sugar Loaf Hill, and is 10 miles long, 3½′ on top, 2½′ on bottom, and 2′ deep, with a 14′ grade per mile, and of 500 inches capacity.

Eagle Bird Ditch.—It diverts water on the south side of the South Yuba River, and is 4½ miles long, 4′ on top, 3′ on bottom, and 3′ deep, with a 14′ grade per mile, and of 800 inches capacity. The water is delivered to the Eagle Bird hoist, under 250′ head.

Eureka Lake Ditch System.—No data.

Excelsior Water Co.—Its ditch starts 2½ miles from White's Crossing, and 4 miles N.W. of Nevada City, on the South Yuba River, and extends along the south bank to Smartsville. It is 35 miles long, 5′ on top, 4′ on bottom, 4′ deep, with 14′ grade per mile. It has a second ditch heading on the south side of Deer Creek, and carrying 1,700 miner's inches 35 miles to Rough and Ready and Penn Valley; it is 4′ on top, 3′ on bottom, 3′ deep, with a 14′ grade per mile.

Farrel Ditch.—It heads on the east side of Wolf Creek, below Allison Ranch, and runs to the Southern mill. It has a capacity of 400 miner's inches, and is 3½′ on top, 2½′ on bottom, 2′ deep, with a 14′ grade per mile.

Gauthier Ditch.—It heads 1,000′ below the Maryland Mine and above the Crown Point Mine, south side of Wolf Creek. It is 3½′ on top, 2½′ on bottom, 2′ deep, and 1 mile long, with a 14′ grade per mile, carrying 2,000 miner's inches, delivered under 40′ head.

Hawkins Ditch.—It heads on the west side of Wolf Creek below the Omaha Mine, and carries water ½ mile to the Franklin shaft, delivering 200 inches under 60′ head. It is 3′ on top, 2½′ on bottom, and 1½′ deep, with a 14′ grade per mile.

Laramie Ditch System.—It heads on Wolf Creek, at a point below the Massachusetts Hill power-house, and is 4′ on top, 3′ on bottom, 3′ deep, with a 16′ grade per mile, and carries 700 miner's inches. It runs east of the Omaha hoisting works, and is 1¾ miles in length; at this point is a bulkhead with two lines of 30″ pipe, 600′ long, giving at the hoisting works 95′ head. The water is then picked up, together with Omaha waste water, and conducted to a point east of the Allison Ranch shaft by a ditch on the east side of Wolf Creek, 1½ miles long, 4½′ on top, 3′ on bottom, and 3½′ deep, with a 14′ grade per mile, and capacity of 1,000 miner's inches. At the end of the ditch the Allison Ranch Mine takes the water through a 30″ pipe, 500′ long, and under 65′ head at the hoisting works.

Little York Ditch.—It heads at Bear Valley, on the north side of Bear River, and runs 30 miles to Little York. It is 5′ on top, 4′ on bottom, and 4′ deep, with a 14′ grade per mile, and of 1,500 miner's inches capacity.

Martin Ford Ditch.—It takes water from Wolf Creek at Boston Ravine, and carries it to the Granite Hill Mine, a distance of 1,800′, in a ditch 4′ on top, 3′ on bottom, and 3′ deep, with a 14′ grade per mile, and of 600 inches capacity. It falls 18′ into the Laramie ditch, going to Granite Hill Mine.

Milton Ditch Co.—No data.

Nevada County Electric Power Co.'s Flume.—This heads 1¼ miles above Perkins bridge on the South Yuba River, and is 3½ miles long. It is 6′ wide and 5′ deep, with a 12½′ grade per mile, and of 5,000 miner's inches capacity; it is carried to a point 500′ E. of the dam of the Excelsior Mining Co., and thence, in two 36″ pipes 500′ long, to the powerhouse under 200′ pressure.

Norambague Ditch.—It heads on the east side of Wolf Creek, 1,000′ below the Southern mill, and runs 1 mile to the Norambague Mine and delivered under 75′ head. It is 4′ on top, 3′ on bottom, and 2½′ deep, with a 14′ grade per mile, and of 600 inches capacity.

North Bloomfield Ditch.—It heads at Bowman's Dam and is 40 miles long to North San Juan, and of 3,000 inches capacity; the ditch is 6′ on top, 4′ on bottom, and 4′ deep, with a 14′ grade per mile.

Omega Ditch.—It heads on South Yuba River, ½ mile below Blue Tent. It is 15 miles long, 4′ on top, 3′ on bottom, and 3½′ deep, with a 14′ grade per mile, and of 1,500 miner's inches capacity.

Paddy Campbell Ditch.—It heads on the west side of Wolf Creek, 1 mile below the Southern mill, and is 25 miles long to Smartsville; it is 4½′ on top, 3′ on bottom, 3½′ deep, with grade of 14′ per mile, and of 800 miner's inches capacity. It is used for irrigation around Smartsville.

Southern Ditch.—It heads on the west side of Wolf Creek, below the Allison Ranch, and runs 2 miles to the Southern mill, carrying 400 inches in a ditch 3½′ on top, 2½′ on bottom, and 2′ deep, with a 14′ grade per mile, giving 100′ head at the mill.

South Yuba Water and Mining Co.—Its canal heads at Lake Spaulding on the South Yuba, above Bear Valley, N. of Emigrant Gap. The main ditch is 45 miles long, 8′ on top, 5′ on bottom, 4′ deep, with a 14′ grade per mile, and has a capacity of 5,000 miner's inches. It has the following branches: *The First branch* starts near Holsenbecker place, comes by Banner Hill to Bryan's ranch, and is 5 miles long, 6′ on top, 4′ on bottom, 4′ deep, with a 14′ grade per mile, and has a capacity of 3,000 miner's inches. It empties into two reservoirs, one owned by the Maryland Co., and the other by the Grass Valley Water Co. These reservoirs cover about 5 acres each. The Maryland Co. has 1½ miles of 22″ pipe, with a head of 525′ at its works. The Grass Valley Water Co. has 1½ miles of 22″ and 20″ pipe to the Empire Mine, with 420′ head at hoist and 450′ at mill. This pipe is continued to Massachusetts Hill through 7,000′ of 20″ pipe, with 770′ head at powerhouse. A second 20″ pipe from Empire Mine takes waste-water 2 miles to the North Star mills, where it is delivered under 280′ head, and at the hoisting works under 232′ head. Another pipe-line of 2,500′ takes water to the Brunswick Mine, with 275′ head. East of the Brunswick Mine the Independence Mine taps the pipe, under 220′ head. The Orleans Co. taps the same pipe with 1,000′ of 8″ pipe, taking 16 miner's inches, delivered at the mine under 420′ head. At the same point the Osborne Hill Mine takes water through 5,000′ of 6″ to 3″ pipe, delivered under 80′ head. The waste-water from the North Star pipe is taken from the mill in a ditch ¾ mile long, 3½′ on top, 2½′ on botttom, and 2½′ deep, with 6′ grade per mile, carrying 400 miner's inches, to the bulkhead, and through 5,000′ of 18″ to 16″ pipe to the Allison

Ranch Consolidated Mining Co.'s Mine, under 235′ head. From the Allison Ranch bulkhead the ditch is continued ½ mile to the Omaha Consolidated, whence 900′ of an 8″ pipe conveys water to the Lone Jack Mine, under 85′ head. *The Town Talk branch* extends from Nevada City to Town Talk, and thence to the reservoir of the Grass Valley city waterworks, carrying 1,000 miner's inches, and is 5′ on top, 3′ on bottom, 3½′ deep, with 14′ grade per mile. It furnishes Grass Valley with drinking and irrigating water at a cost of 18 cents per inch for twenty-four hours, measured under 6″ pressure, equivalent to 1.42 cu. ft. per minute. *The Third branch* starts from Nevada City, on the south side of Deer Creek, and is 3 miles long, 4′ on top, 3′ on bottom, and 2½′ depth, with a 14′ grade per mile, and a capacity of 800 miner's inches. It supplies the Champion Mine through 1,500′ of 18″ pipe, and the Home Mine through 1,000′ of 14″ pipe, under 250′ head. *The Fourth branch* starts from a reservoir at Sugar Loaf Hill, runs around Cement Hill, and goes to the Providence and Mountaineer mines, and is 4½′ on top, 3′ on bottom, 3½′ deep, and carries 800 miner's inches. Two thousand feet of 18″ pipe lead to the Providence under 340′ head, and 2,500′ of 16″ pipe under 330′ head to the Mountaineer. John Spaulding, of Nevada City, superintendent.

Washington Ditch.—It heads at Fall Creek, running S. of the South Yuba River, above the Washington Mine, where the water is delivered under 250′ head. It is 5 miles long, 4′ on top, 3′ on bottom, and 3′ deep, with a 14′ grade per mile, and of 800 miner's inches capacity.

Placer County.

American Bar Ditch.—Water is taken from Stitchner's Gulch and conveyed by ditch 3 miles to the American Bar Mine. It has a capacity of 100 inches, running on a heavy grade. American Bar Mining Co., of Michigan Bluff, owner.

Big Dipper Ditch.—It is 10 miles long, taking water from Shirt-tail Cañon, and delivering it at the Big Dipper Mine, where it is used for power. It has a capacity for 250 inches of water, but in summer and fall this is reduced to 75 inches. Big Dipper Mining Co., of San Francisco, owner.

Breece & Wheeler Ditch.—This was formerly a large ditch, having a capacity of 5,000 miner's inches, the water being taken from El Dorado Cañon. It is now out of repair and in disuse. Breece & Wheeler, of San Francisco, owners.

Cedar Creek Ditch.—It heads on American River, and is 45 miles long, 6′ wide on top, 4′ on bottom, and 3′ deep, with 16′ grade per mile, and of 4,000 miner's inches capacity.

Dardanelles Ditch.—It is 9 miles in length, taking water from Volcano Cañon, and delivering it at Dardanelles Mine. With an original capacity of 500 inches, it now will carry only 150, and in summer is reduced to 60 or 75 inches. Dardanelles Mine, of Forest Hill, owner.

Gold Run Ditch.—It heads in Bear Valley, above Cisco, and is 40 miles long, 6′ wide on top, 4′ on bottom, and 3′ deep, with 16′ grade per mile, and of 4,000 miner's inches capacity.

Iowa Hill Ditch.—It is 8 miles in length, and of 2,000 inches capacity, with only 500 inches running in July last. Morning Star Mining Co., of Colfax, owner.

Miners Ditch.—This ditch embraces a system 20 miles in length, taking water from Shirt-tail Cañon, and is of 2,000 miner's inches capacity. It is used for mining only. Mayflower Mining Co., of Forest Hill, owner.

South Yuba Canal.—This is one of the most important canals in this part of the State. (See Nevada County.) Its sources of supply are South Yuba and Bear rivers. The main line is 60 miles in length, and its numerous branches as many more. The capacity is about 5,000 miner's inches. The water is used for mining, power, and irrigation. South Yuba Water Co., of Auburn, owner.

Union Ditch.—This is 12 miles long, and takes water from Black Hawk and Young America cañons. It has a capacity of 150 inches. Mayflower Mining Co., of Forest Hill, owner.

Plumas County.

In that portion of Sierra Valley belonging to Plumas County, a number of artesian wells have been sunk on a belt from one half to three fourths of a mile wide, from which flow both hot and cold mineral waters. The depth of these wells varies from 330′ to 1,000′, and the temperature varies from cold drinking to scalding hot. No analyses of the waters were procurable, but they evidently contain sulphur and alkali, and some of them salt and iron. The majority are flowing wells.

Sacramento County.

The lowlands along the Sacramento River scarcely need irrigation, and the streams flowing into the county from the east afford ample facilities for irrigation where necessary. Moreover, a good supply of subterranean water may be obtained in most parts of the valley at a depth of 100′ to 150′. A large quantity may be obtained from 20′ to 60′ in depth, but that from the deeper strata is generally better. Flowing wells are rare, though but little prospecting has been done to test the deep strata. That which flows from the artesian and gas wells at Sacramento and on the Haggin ranch, like that at Stockton, is too mineralized for general use. The "dug" wells of the county are fully described in our Xth Report, pp. 496–506. The strata penetrated are clay, sand, and gravel, which lie approximately horizontally, and vary in character, thickness, and extent.

Elk Grove Waterworks Well.—It is at the station; is 12″ in diameter and 170′ deep. Water was struck at a depth of 156′, rises to within 15′ of the surface, and yields 150,000 gals. daily by pumping, without materially affecting the supply. The strata penetrated are—

Soil	4′
Compact clay	4′
Yellow clay with bowlders	9′
Clay, silt, and bowlders	33′
Light-blue clay	12′
Coarse gravel and sand	4′
Blue clay	63′
Water-bearing gravel and sand	24′
Total	153′

The water is principally used for domestic purposes. Other similar wells near Elk Grove are used for irrigation purposes

Galt Waterworks Wells.—There are two 6″ wells, 96′ and 120′ deep, and the water rises to within 18′ of the surface. Fourteen thousand gallons of good water are pumped in two hours daily, for domestic purposes. Surface water may be obtained in that locality 15′ to 20′ in depth, but the second and better water is 40′ to 100′ in depth.

Interior Development Co.—See Amador County.

Natoma Ditch.—See El Dorado County.

Orange Vale Irrigation District.—It is at Orange Vale Colony, on the north side of American River, opposite Folsom, and 6 miles S. of Roseville. It takes water from the American River and Mining Co.'s ditch, by an iron pipe 26″ to 11″ in diameter, about 3 miles long, and follows approximately the variable grade of the surface. It irrigates about 400 acres. G. B. Katzenstein, of Sacramento, secretary; E. C. Bedell, of Orange Vale, superintendent.

Williams, R., Wells.—These (five) are ½ mile E. of Sacramento, and are said to be 10″ in diameter, and about 150′ deep. The water from three water-bearing strata rises to within 16′ of the surface. The strata penetrated are thick beds of clay, separated by thinner beds of sand. They were bored to obtain a supply for the city, but found to be more or less unsatisfactory, and are not utilized. The following chemical analysis is by Prof. W. B. Rising, of the State University at Berkeley:

	Grains per U. S. Gallon.
Sodium chloride	4.760
Sodium bicarbonate	1.230
Magnesium carbonate	1.510
Calcium carbonate	4.024
Calcium sulphate	0.764
Oxide of iron and aluminum	0.939
Silica	3.010
Loss	0.019
Total	16.256

San Benito County.

The artesian area is an irregular belt, stretching northward from Hollister toward Gilroy, in Santa Clara County. The wells vary in depth and flow. The strata penetrated are impervious clays, sands, and water-bearing gravels, which lie almost horizontally. Definite records of individual wells are not preserved in many cases, and the information available is both fragmentary and generalized. Wells near San Juan and northward in the San Benito Valley are similar to those about Hollister. There are said to be about 100 artesian wells within an area of about 4 miles square near the boundary of the county, in the vicinity of San Felipe. They are from 2″ to 7″ in diameter, 80′ to 130′ deep, and the larger ones are stated to flow 1,000,000 gals. or more daily, each. The flow is generally diminished as the number increases. Small wells are more satisfactory, for the pressure is so great that large wells are hard to control, throw out sand, gravel, and clay, and cause the ground to cave. The flow is generally stronger in winter than in summer, and varies from a surface flow to 20′ piped above surface. Though the water is charged with minerals to some extent, it is suitable and used for irrigation and domestic purposes.

The water from the mountain streams, San Felipe Creek, etc., enters the valley along its margin, where the strata are porous, and finds its way into the gravel beds and channels which underlie the impervious clays of the artesian areas.

Brun's, P., Wells.—There are four of them, about 1 mile N. of San Juan, 2″ to 7″ in diameter and 100′ to 123′ deep. The strata penetrated are blue and yellow clays, separated by thinner layers of sand and water-bearing gravels.

Chase's, Newton, Well.—It is 1½ miles S. of San Felipe, at about 200′ altitude, and is 7″ in diameter, 93′ deep, and flows a stream sufficient to irrigate 50 acres of alfalfa, etc.

Culp's, J. D., Wells.—There are thirteen of them, on the "tobacco farm," ¾ mile S.W. of San Felipe, at about 190′ altitude. They are 2″ to 7″ in diameter and 80′ to 112′ deep. They penetrate clay and alluvial sediment to the water-bearing gravels, which are generally overlaid by 12″ to 18″ of hardpan. Used for irrigation.

Hollister Irrigation Co.'s Canal.—It is near Hollister. It is 20′ wide, 4′ deep, 2 miles long, and has three main branches of 5 miles each. Water is diverted from San Benito River, about 5 miles S.E. of Hollister, and irrigates about 7,000 acres of trees, vines, alfalfa, etc. N. C. Briggs, of Hollister, secretary; B. F. Gould, of Hollister, manager.

Hollister Water Co.'s Well.—This group of three wells is in Hollister. They are 10″ in diameter, and 200′, 279′, and 356′ deep, respectively. The water, principally from gravels 175′ to 200′ deep, rises to within 2′ of the surface. They yield 4,000,000 gals. daily by pumping, which shows no tendency to exhaust them. P. W. Hawkins, of Hollister, secretary.

McMahon's, B., Well.—It is about 2 miles N. of Hollister. It is 7″ in diameter, about 600′ deep, and flows sufficient water for stock purposes. The strata penetrated are heavy beds of clay, with thinner layers of sand and gravel.

Miller & Lux Wells.—There are a number of artesian wells on their ranch north of San Benito River, which are said to be 75′ to 375′ deep, and afford a large quantity of water used for stock.

Spitts Bros.' Well.—It is 1 mile W. of San Juan. It is 7″ in diameter, 103′ deep, and flows 1″ over the casing. The strata consist of 98% of yellow to black clays, and 8′ of water-bearing gravels.

Watson's, D. J., Well.—It is one block south of the waterworks in Hollister. It is 6″ in diameter, 175′ deep, and flows a fair stream. Cannot be exhausted by a windmill pump. The following strata were penetrated:

Soil and clay	32′
Coarse gravel	46′
Blue clay	22′
Compact sand	12′
Sand and gravel	40′
Hard, sandy clay	21′
Water-bearing gravel.	

Wilson's, A., Wells.—There are eight of them, 1½ miles W. of San Felipe. They are 3″ in diameter, 120′ to 130′ deep, and flow 16″ to 18″ over the casings. They penetrate three water-bearing strata of sand and gravel, at depths of 75′, 100′, and 120′, which are overlaid by heavy beds of impervious clay and marsh sediment.

San Diego County.

Cuyamaca and San Diego Flume Co.—This company owns the large reservoir 60 miles N.E. of San Diego, known as the Cuyamaca Lake, and the extensive flume system connecting the reservoir with San Diego. It has supplied the ranches of the mountain valleys along its route and also the City of San Diego with water for several years.

Pine Valley Water and Land Co.—This company was organized for the purpose of constructing a dam at the lower end of Pine Valley, at 3,700′ elevation. The drainage area of the basin is 46 square miles, and the area of the proposed reservoir is 800 acres. It is estimated that it will furnish a continuous supply of 1,600 miner's inches of water. Work on the dam has not yet been commenced. Eugene Frandzen, of San Diego, secretary.

Southern California Mountain Water Co.—This company has constructed a dam on Otay Creek which is calculated to cover the open valley above for a mile or more; the depth at the dam to be 104′. The dam was constructed by building a concrete wall 2′ thick, reaching from wall to wall in the cañon on a broad base of concrete resting on bedrock. Both above and below this wall has been dumped a vast quantity of loose rock, quarried from the sides of the cañon. The overflow passes over a low depression between neighboring hills, the dam being higher than this depression. A tunnel has been driven through the hill on the south side of the valley, 600′ above the dam, through which water will be taken as required, the quantity to be regulated by gates. Connecting with the tunnel on the opposite side of the hill is the beginning of a large ditch and flume which will be built to convey the water to the City of San Diego, where it will be used for domestic purposes, etc. E. S. Babcock, of Coronado, manager.

San Francisco.

The subterranean water-supply of the San Francisco peninsula is very great, and comparatively unimproved. The following is but a portion of the wells bored:

Almshouse.—This artesian well flows 6,000 gals. daily into the reservoir on Strawberry Hill, at an altitude of 25′ above the well.

Baldwin Hotel.—It uses artesian water from its own wells for all purposes.

Baum, Chas.—His well is at 1705 Powell Street, and the water could not be lowered below the 22′ point by pumping.

Bradbury, Capt.—This well affords ample water for the entire neighborhood.

Center, John.—This well, at Sixteenth and Folsom streets, supplies water for several families.

City Hall.—This well supplied abundant water for all purposes until it was accidentally sealed by cement getting into it.

Crocker Building.—Its well is 180′ deep, and affords ample water for all purposes. Twenty-five thousand gallons are pumped daily. Spring Valley water used for drinking.

Fagoni, Francisco.—This well, on the block bounded by Stockton, Dupont, Greenwich, and Union streets, supplies water for the neighborhood, and is pumped by a windmill and auxiliary steam engine.

Golden Gate Park.—Five 20″ wells were sunk to an average depth of 145′, and afford by pumping 1,500,000 gals. daily.

Harrold, John.—This well is on Filbert Street, between Powell and Mason, and supplies the brewery, etc.

Howes, Jr., Horace.—He had a well on Ninth Street, supplying the neighborhood. Another well was started on an adjacent lot and an ineffectual attempt made to pump him out. Finally an arrangement was made with the water company, and the well sealed.

Hiller, Dr.—This well is at the N.W. corner of Broadway and Kearny streets, and if in order would supply the whole neighborhood.

Lick House.—Its well affords abundance of water for all purposes, but city water is used for drinking and culinary purposes.

Llewellyn, R.—His well, on Buena Vista Avenue, is 100′ deep, and supplied all in the vicinity till closed under an arrangement with the water company.

Lycett.—These wells, on Shotwell near Eighteenth Street, furnished 900,000 gals. daily until they were sealed.

Mitchell.—These wells, on Fourteenth Street, between Howard and Mission, are capable of furnishing 500,000 gals. daily.

Palace Hotel.—These six wells afford ample water for all purposes, but it is used for laundry and cleaning purposes only.

Pracy, Geo. T.—This well is at Twenty-fourth and Noe streets, and supplies his own household.

Small, D.—It is at 407 Greenwich Street. The water comes in such profusion that a pipe had to be put in to carry surplus to the sewer.

St. Nicolas Hotel.—Its well is 200′ deep, and supplies water for the whole block, 30,000 gals. being pumped daily. When the pumps have been run to their greatest capacity, no diminution was noticeable.

San Joaquin County.

The artesian area is in the central part of the county, on the east side of the San Joaquin River. Wells are numerous in and about Stockton, and here and there southward. The water in many cases is too mineralized for domestic and irrigation purposes, and from the majority of wells is accompanied by considerable inflammable ("natural") gas. Flowing water is generally obtained at 975′ to 1,200′. The artesian and gas wells are 975′ to 2,000′ deep, and penetrate alternating beds of clay, sand, etc. See our VIIth, VIIIth, and Xth Reports, pp. 181, 558, and 549.

Bishop's, H. B., Well.—It is 4 miles N.E. of Stockton. It is 8″ in diameter, 1,128′ deep, and is said to flow about 400,000 gals. daily.

Grattan's, Dr., Well.—It is 3½ miles N.E. of Stockton. It is 8″ in diameter, 1,010′ deep, and was said to flow about 400,000 gals. daily when first completed; the flow has greatly decreased.

Ladd's, C. A., Well.—It is 6 miles S.E. of Stockton. It is 7″ in diameter, 975′ deep, with a light flow, but affords a large quantity of water for irrigation by pumping.

Stanislaus and San Joaquin Water Co.'s (San Joaquin Land and Water Co.) Canal.—See our Xth Report, pp. 565 and 688. Also see Stanislaus County. Water is diverted from the Stanislaus River, 6 miles above Knight's Ferry, and enters this county from the east through the main laterals, which distribute it over a large area of valley lands in the southwestern part of the county. About 20,000 acres can be irrigated in the county, and it is the purpose of the company to increase the capacity until more than 100,000 acres can be irrigated. H. W. Cowell, manager; E. C. Cowell, secretary; H. I. Willey, of San Francisco, consulting engineer.

Stockton Water Co.'s Wells.—See our Xth Report, p. 550. They are on the east side of Stockton, and consist of four flowing and sixty-two shallow wells. Three are each 8″ in diameter, 975′ to 1,080′ deep, and flow 500,000 gals. daily; one is 10″ in diameter, 575′ deep, and has a light flow; the temperature of the water from the flowing wells is 78° F. There are four 8″ wells, 220′ to 240′ deep, from which 4,000,000 gals. have been pumped daily, and the supply is said to be large enough to pump 10,000,000 gals. daily. The following analysis is by Prof. Hilgard:

	Grains per Gallon.
Sodium carbonate	4.330
Sodium chloride	3.410
Chlorine	2.070
Free ammonia	0.250
Albuminoid ammonia	0.124

M. S. Thresher, of Stockton, superintendent.

Woodbridge Canal and Irrigation Co.'s Canal.—See our Xth Report, p. 565. It diverts water from Mokelumne River, near Woodbridge. It is 15 miles long, averages 35′ on top, 15′ on bottom, and 8′ deep, with a grade of ¾″ (?) per mile, and irrigates 8,500 acres. M. T. Moses, of San Francisco, secretary; B. Laws, of Woodbridge, superintendent.

Santa Barbara County.

There are about thirty artesian wells in the Santa Maria Valley, from Guadaloupe 5 miles westward, at 60′ to 90′ altitude. They are principally 3″ in diameter, and 100′ to 125′ deep, though a few are deeper. The water is obtained from beds of gravel and sand, 1′ to 25′ thick, separated by clays, and lying horizontally. The town of Guadaloupe is supplied with water principally from artesian wells, and the water is forced into elevated tanks by hydraulic rams. In the valley above Guadaloupe an abundant supply of water is obtained from wells by pumping. The waters are generally used for domestic, stock, and irrigation purposes.

Santa Clara County.

There are numerous artesian wells in the Santa Clara Valley, from which a vast supply of water is obtained for irrigation, domestic, and stock purposes. They are principally in an area bordering the southern part of San Francisco Bay, and a smaller area S.E. of Gilroy, and in each case extending to the inclosing hills. The number of artesian wells bored in the county probably exceeds 1,000, and is sufficient to determine definitely the areas in which flowing water may be obtained. Unfortunately, however, the records of the strata penetrated have been preserved in but few cases. The information available is, therefore, both second-hand and too fragmentary to delineate definitely the various strata which make up the valley. In general, however, the strata are almost horizontal beds of clay, with thinner alternating layers of water-bearing sand and gravel. The deeper wells penetrate a number of strata, and the casings for the most part are perforated at each water-bearing stratum in order to receive the combined supply furnished by all the strata penetrated. The sediments are generally finer toward the center of the valley and become coarser, with more bowlders, which increase in size, and the strata, therefore, are more porous as the bordering foothills are approached. Outside of the area of flowing wells a good supply of water is generally obtained throughout the valley by pumping. The State law, enacted in 1878, requiring owners of artesian wells to keep them capped when not using water is very generally observed.

Agnews Asylum.—There are a number of important artesian wells on the asylum ranch, which furnish a large supply of water for irrigation and other purposes. One bored at the asylum in 1889 is 8″ in diameter, 585′ deep, and said to flow 400,000 gals. daily. J. W. Lowe, of San Francisco, bored one at the asylum in 1895. A 14″ casing extends to a depth of 59′, a 12″ casing extends from the surface to a depth of 735′, and a 10″ casing from the surface to a depth of 782′, the object being to separate the different flows. The pressure of the water at the surface is said to be 21½ lbs. per square inch, and flows more than 600,000 gals. daily when open to full capacity. The temperature of the water is 80° F., and when used in boilers deposits a light sediment. The strata penetrated are as follows:

	Feet.
Alluvial sediment	8
Clays	112
Sand and gravel	6
Blue clay	14
Gravel	6
Clays	81
Water-bearing sand and gravel	13
Yellow clay	10
Black sand	5
Clays	100
Water-bearing sand and gravel	7
Blue clay	37
Black sand	5
Clays	38
Sand and gravel	4
Clays	18
Sand and gravel	4
Yellow clay	5
Sand and gravel	3
Blue clay	3
Water-bearing sand and gravel	25
Clays	28
Sand and gravel	5
Clays	25
Sand and gravel	7
Yellow clay	7
Black sand	3
Clays	53
Water-bearing sand and gravel	4
Yellow clay	8
Water-bearing sand and gravel	11
Clays	16
Water-bearing sand and gravel	4
Yellow clay	26
Sand	2
Clays	22
Sand	3
Clays	15
Water-bearing sand and gravel	5
Clay	5
Water-bearing gravel	5
Clays	16
Water-bearing gravel	8
Total	782

Alviso Wells.—Here are about twelve artesian wells within a radius of ¼ mile. They are 7″ in diameter, 230′ to 235′ deep, and flow from ½″ to 2″ over the casings. The strata penetrated by them vary but little, and are—

Clay	90′
Sand	29′
Gravel	3′
Blue and yellow clay	74′
Sand	8′
Gravel	7′
Yellow clay	15′
Sand and gravel	7′
Total	233′

Almshouse Wells.—There are three artesian wells on the County Almshouse ranch, 1 mile S.W. of Milpitas. They are 7″ in diameter, and said to be 400′, 500′, and 640′ deep, and flow a very great quantity of water, which is used for irrigation, domestic, and stock purposes. The strata penetrated are heavy beds of clay, separated by thinner beds of water-bearing sand and gravels.

Ballon's, J. Q. A., Well.—It is 1½ miles N. of San José. It is 7″ in diameter, 520′ deep, and flows 9″ over the casing. The strata penetrated are principally clay, and a 30″ bed of water-bearing gravel in the bottom.

Boots', Wm., Wells.—There are six artesian wells on the Boots ranch, on Coyote Creek, 2 miles W. of Milpitas. Five are 7″ and one is 8″ in diameter; they are 250′ to 600′ deep, and flow from 2″ to 5″ over the casings. The well at the ranch-house, 600′ deep, has sufficient pressure to force the water through a garden hose over a two-story house. It penetrates water-bearing gravel of 150′ total thickness, of which the first was encountered at 60′ below the surface. The principal water-bearing gravels in that locality lie at a depth of 240′ to 260′, and are overlaid by a heavy bed of blue clay, which changes near the bottom to a hard, yellow, compact clay, which forms a cement-like cap over the water. A 34′ bed of sand occurs in one of the wells at a depth of 234′. A large redwood log, in good state of preservation, and deposits of leaves, fish-bones, etc., were found at considerable depths.

Burrell's, E., Wells.—There are four artesian wells on the Burrell ranch, 1 mile N. of Agnews. They are 7″ in diameter, 245′, 552′, 632′, and 450′ deep, and flow ¾″, 3″, 1⅕″, and 1″ over the casings. The strata penetrated are—

Alluvial soil	10′
Yellow clay	90′
Blue clay	425′
Water-bearing gravel.	

The gravel beds in this locality are generally from 4′ to 10′ thick, and have a solid clay or cement-like cap, 8″ to 10″ thick.

Citizens Water Co.—This company is constructing a canal to extend from near Coyote to San José for furnishing water for irrigation and municipal supply. The canal is 10′ wide on top, 7′ on the bottom, 4′ deep, and has a grade of 2′ per mile. Three miles of the main canal is now completed. The water is obtained from an extensive deposit of gravel, which serves as a natural reservoir, fed by Coyote Creek. It is obtained from fifteen artesian wells in the canal near its head. They are 10″ in diameter, 45′ deep, and flow 1″ to 2″ over the casings. E. G. Wheeler, of San José, superintendent.

Dunahue's, P. J., Wells.—There are seven wells on the Dunahue ranch, 2 miles N. of Santa Clara. They are 7″, 10″, and 12″ in diameter, 175′ to 250′ deep, and flow a great quantity of water. One bored in February, 1896, at the ranch-house, is 10″ in diameter, 198′ deep, and flowed about 300,000 gals. daily when completed. The strata penetrated are blue and yellow sandy clay, and in the bottom is a heavy bed of coarse water-bearing gravel.

Edwards', W. A. J., Well.—It is on the Alviso road, 3 miles N. of San José. It is 7″ in diameter, 285′ deep, and flows 7″ over the casing. Three water-bearing beds of gravel were penetrated at 223′, 228′, and

245′ deep. That struck at 245′ is 35′ thick and supplies the greater quantity of water. The gravel beds are each overlaid by heavy beds of impervious clay.

Gallagher's, A. T., Wells.—There are six wells on the Gallagher ranch, 1 mile S. of Alviso. Three of them are strong wells, 7″ in diameter, 583′. 670′, and 805′ deep, and flow about 5½″ over the casings. The strata are heavy beds of blue and yellow clay, separated by gravel and sand.

Huff's, J. A., Wells.—These three wells are on the ranch, 2 miles E. of Mayfield. They are 7″ in diameter, about 400′ deep, and flow about 1″ over the casings. The strata penetrated are—

Adobe clay	15′
Red clay	25′
Blue clay	150′
Water-bearing sand	2′
Red clay	15′
Blue clay	46′
Water-bearing sand	2½′
Yellow clay	1½′
Blue clay	62′
Cement	1½′
Yellow clay	15′
Blue clay	14′
Water-bearing gravel	1½′
Blue clay	44′
Cement	2′
Water-bearing gravel	3′
Total	400′

Other wells on Mr. Huff's ranch are of the same general character as the above.

McCubin's, R., Wells.—There are four wells on the McCubin ranch, 4 miles N. of Lawrences. They are 6″ and 7″ in diameter, 175′ to 335′ deep, and flow ½″ to 2″ over the casings.

McLee's, E., Well.—It is on Penitentia Creek, at Milpitas. It is 7″ in diameter, 264′ deep, and flows 2″ over the casing. The strata penetrated are—

Alluvial sediment	10′
Impervious blue clay	242′
Water-bearing fine gravel	12′

Montague's, W. W., Wells.—His fourteen wells are ½ mile S.W. of Agnews. No data.

Ogier's, C. L., Wells.—There are five wells on Ogier's ranch, 2 miles N. of San José. They are 7″ in diameter, 275′ to 300′ deep, and flow 3″ to 5″ over the casings.

Ogier's, Mrs. M., Wells.—There are five wells on Mrs. Ogier's ranch, 2¼ miles N. of San José. They are 7″ in diameter, 275′ to 308′ deep, and flow about 3″ over the casings.

Phelan Wells.—There are four strong artesian wells on the Phelan ranch, just north of San José. They are 7″ in diameter, 150′ to 250′ deep, and flow enough for irrigation purposes. One well is said to have flowed 15″ over the casing when completed, and is yet a very strong well.

Polhemus', C. B., Wells.—There are three wells on the Polhemus farm, 1 mile N. of San José. They are 7″ in diameter. Two flow a small quantity each, and the other is said to be 264′ deep, and is strong enough to flow over the casing 20′ above the surface.

Rea's, Samuel, Wells.—There are two good artesian wells on the Rea ranch, 4 miles S.E. of Gilroy. They are 7″ in diameter, and 300′ and 345′ deep. The water-bearing gravel in those wells is said to be overlaid by 140′ of blue clay.

Rengstorff's, H., Wells.—There are six wells on Rengstorff's ranch, 2½ miles N. of Mountain View. They are 7″ in diameter. One is 792′ deep, and has a light flow; five are 160′ to 300′ deep, and now flow 1″ to 2″ over the casings; one at the ranch-house is said to have flowed 9″ over the casing when completed, but has greatly decreased.

Santa Clara Waterworks' Wells.—A group of four artesian wells were recently bored in the town of Santa Clara, from which water will be pumped for municipal purposes. They are each 10″ in diameter, 225′ to 235′ deep, and flow 1″ over the casing. The capacity of the pumping plant is 1,000,000 gals. daily. The storage tanks are on a steel tower about 100′ high. The strata penetrated by the wells are—

Black adobe	9′
Black sand	11′
Blue clay	13′
Red sediment	29′
Gravel	14′
Red clay	3′
Red sand	24′
"Cement"	14′
Gravel	11′
Blue clay	18′
Gravel	7′
Blue clay	16′
"Cement"	3′
"Red soil"	2′
Cement	2′
"Red soil"	4′
Gravel and sand	5′
Blue clay	8′
"Red soil"	8′
Gravel	26′
Clay	2′
Total	229′

Swall's, P., Wells.—There are four wells on this ranch, 1¼ miles S.E. of Mayfield. Two are 6″ and two are 7″ in diameter; they are 178′, 255′, 322′, and 356′ deep, and flow 2¼″, 1″, 4½″, and 3⅜″ over the casings. The strata penetrated are heavy beds of blue clay and thinner layers of sand and gravel.

Wade's, E. E., Wells.—There are four wells on this ranch, 4 miles N. of San José. They are 7″ in diameter, 250′ to 260′ deep, and flow from 2″ to 8″ over the casings.

Williams', F. E., Wells.—There are seven artesian wells on his farm, 2 miles S.E. of San José. They are 7″ in diameter, 80′ deep, and flow about 1″ over the casings. The strata penetrated are heavy beds of blue clay, and water-bearing gravel near the bottom.

Zook's, T. C., Wells.—There are two wells, one of which is 2½ miles E. of Gilroy, 7″ in diameter, 90′ deep, and has a light flow. The other one is at the ranch-house, 3½ miles E. of Gilroy, is 250′ deep, and flows enough for garden and domestic purposes.

Santa Cruz County.

From Watsonville artesian wells occur in a narrow belt extending westward to the coast, and vary in depth from 70′ to 256′. Those about Watsonville are said to be from 70′ to 100′ deep, and the depth increases as the coast is approached. The strata penetrated are clays, sand, and gravel, which lie in approximately horizontal layers.

Chalmers Wells.—There are two 10″ wells about 2 miles W. of Watsonville, and said to be about 200′ deep; they flow about ¾″ over the casing. The strata penetrated are clays, with thinner layers of sand and gravel.

Goodall Well.—It is on the coast W. of Watsonville, and was bored a number of years ago by Anthony Ward, of Gilroy. He states that it is 256′ deep, and the strata penetrated are—

Sand and gravel	200′
Clay	20′
Soft, decomposed granite	36′

It is said to have a small flow, which is affected by the tides.

Mitchell Well.—It is about 1 mile W. from Watsonville. It is said to be 7″ in diameter, 70′ deep, and flows 1″ over the casing.

Sugar Factory Wells.—See our Xth Report, p. 625. They are near the Watsonville depot, and are said to be from 7″ to 12″ in diameter; from 70′ to 100′ deep, and yield by pumping 4,000,000 gals. daily, which is used at the factory. The water is slightly charged with iron.

Shasta County.

Baker's, R., Wells.—There are two on Baker's ranch, in Fall River Valley; sunk to a depth of 208′. They have a steady flow of 3 miner's inches; the water is cold, with a slight taste of iron.

Bowman, J. F.—In Fall River Valley he carries on a system of irrigation, using a steam-pump to raise 35,000 gals. of water per minute out of Pitt River, as it is too low to permit of gravitation works.

Dry Creek Tunnel and Fluming Co.—This was formerly the Hayward, or Hardscrabble, ditch, and diverts the waters from the Hoover, Eagle, and North Fork of Cottonwood creeks, and the South Fork of Clear Creek. The main canal is 24 miles long, 9′ wide on top, 6′ on bottom, and 3′ deep; part of the canal has a grade of 9′ to the mile; the remainder 3′ to the mile. The water is used for irrigation, mining, and power. The capacity of the main canal is said to be 2,000 miner's inches. Merchants Exchange Bank, of San Francisco, owner; R. G. Harvey, of Ono, manager.

Happy Valley Irrigation Canal.—The main source of water is from the former Hardscrabble mining ditch, starting from the North Fork of Cottonwood Creek. The main canal is 15 miles in length, 6′ wide, and 2½′ deep, with an irregular grade. Of the lateral branches, the main one to Anderson is 10 miles long, 2′ wide on top, 18″ on bottom, 6″ deep, with irregular grade, but averaging 1″ to the rod. Other branches are to different farms, and are quite insignificant ditches. An incorporated company, of San Francisco, owner; R. G. Harvey, of Ono, manager.

Solano County.

There are no irrigation canals in this county, though water could be diverted from Putah Creek, and during a part of the year from smaller streams farther south. The subterranean supply of water in the valley lands is practically inexhaustible. The so-called "surface" water is obtained at depths of 12′ to 20′, but a supply of better water may be obtained at depths of 30′ to 60′. The strata penetrated by wells in the valley are alternating horizontal layers of clay and sand, with bowlders here and there. For further particulars, see our Xth Report, pp. 661–668.

Stanislaus County.

Stock-raising, agriculture, and fruit-growing are the principal sources of revenue, and the economic mineral resources now developed are of minor importance. Undeveloped deposits of coal and manganese are said to be in the Coast Range, and a limited amount of quicksilver is mined near the western boundary of the county. Considerable land is irrigated on the west and east sides of the San Joaquin River. Two large districts are partially developed. Unimproved mineral springs abound in the foothills on the west side of the county.

Flowing wells (see our Xth Report, p. 682) have been obtained near the San Joaquin River above Hill's Ferry, but a large part of the water is brackish and sulphuretted, though good water occurs in places. Small flows have also been obtained locally, near the foothills.

Crow's, Bedford, Well.—It is on the west side of the San Joaquin River, near Crow's Landing. It is 7″ in diameter, 325′ deep, and said to flow about 5,000 gals. daily.

Hill's Ferry Well.—It is on the west side of the San Joaquin River, at Hill's Ferry, and is 7″ in diameter, 325′ deep, and said to have flowed a large quantity. It now leaks through the casing, and only flows about 6,000 gals. daily. The strata penetrated are sand, sandy clay, and 65′ of blue clay, overlying the water-bearing sand.

Oakdale Irrigation Co.'s Canal.—See our Xth Report, p. 689. It is near Oakdale, and is 9 miles long, 20′ wide on top, 10′ on bottom, and 4′ deep, with a grade of 1′ per mile. The dam is broken; the company is preparing to divert water into it from the Stanislaus and San Joaquin Water Co.'s canal, 2 miles N.E. of Oakdale. In disuse. J. H. Clay, of Oakdale, secretary.

San Joaquin and Kings River Canal.—See Fresno County. It is on the west side of the San Joaquin River, and enters the county from the south, extending westerly, and irrigates a belt on the east side.

Stanislaus and San Joaquin Water Co.'s (San Joaquin Land and Water Co.'s) Canal.—See our Xth Report, p. 688. It diverts water from the Stanislaus River, at Six-Mile Bar, in Calaveras County, 6 miles above Knight's Ferry, at 355′ elevation. The water flows through two tunnels, numerous flumes, and open ditches on the north side of the river to the main point of diversion, 3 miles E. of Clyde Station, at 170′ elevation. The main canal is about 18 miles long, and varies greatly in size, grade, and capacity in the different parts. The two tunnels are 1,037′ and 1,047′ long, 12′ and 14′ wide, with 6′ depth of water, and grades of 5.4′ and 7.5′ per 5,000′. The flumes are 6′ to 10′ wide, 5′ to 8′ deep, and with one exception (which is 59′ per 5,000′) their grades are 8′ to 12.3′ per 5,000′; capacity 530 to 850 cu. ft. per second. The ditches are 8′ to 20′ wide on the bottom; depth of water, 4′ to 6′; grade, 1¼′ to 5′ per 5,000′, and capacity 150 to 300 cu. ft. per second. The flumes and tunnels have a greater capacity than the ditches, in order that they may be enlarged when necessary. The main canal, as at present developed, is capable of delivering 100 cu. ft. or more per second at the main point of diversion, less that diverted by the Farmington and Oakdale laterals, which will irrigate 20,000 acres or more. When the canal is enlarged to full capacity it will carry about 650 cu. ft. per second, and irrigate about 130,000 acres, principally in San Joaquin County. The natural watercourses have been taken advantage of as far as possible in developing the system. The total length of canals and main laterals now completed is said to be about 96 miles. It is the purpose of the company to supply the Oakdale Irrigation Co. with water, to be diverted from the canal at a point 2 miles N.E. of Oakdale, which will be used for irrigation on the south side of the river. The Farmington lateral diverts water from the main canal near Knight's Ferry and carries it northwestward, part way through Little John Creek, to irrigate the region about Farmington. H. W. Cowell, manager; E. C. Cowell, secretary; H. I. Willey, of San Francisco, consulting engineer.

Turlock and Modesto Irrigation Districts Canals.—See our Xth, XIth, and XIIth Reports, pp. 688–689, 467–468, and 410. Work has ceased on their construction, pending litigation.

Sutter County.

See our XIth Report, p. 469. The Quaternary valley extends over the entire county except that part occupied by the Marysville Buttes and adjacent foothills, and has an elevation scarcely above the Feather and Sacramento rivers, between which it lies. It is made up of heavy beds of clay, separated by water-bearing sand and gravel. When these water-bearing strata are penetrated by wells, an almost inexhaustible supply of water, suitable for general purposes, is obtained by pumping. No flowing wells have been obtained, but deep borings have not been made to determine the possibilities of obtaining them. About Yuba City a good supply of water may be had in most parts at a depth of 40′, though some wells are deeper, and the strata vary greatly. At Live Oak good water is generally obtained at 25′, though one well bored 1 mile southward is 87′ deep. Westward, as the Sacramento River is approached, the clays become thicker, and the water-bearing strata reach a depth of 100′ or more.

Tehama County.

Considerable land is irrigated in the southern part of the county and on the eastern side of the Sacramento River with water diverted from Antelope, Mill, and Deer creeks, principally through small ditches. See our XIth Report, p. 479.

Sierra V-Flume.—The flume, with 26″ sides, extends from Red Bluff 44 miles eastward to the lumber mills on the headwaters of Antelope Creek, at about 3,400′ altitude, and is used for transporting lumber, etc. Sierra Lumber Co., of No. 320 Sansome Street, San Francisco, owner; Frank Boole, of Red Bluff, superintendent.

Vina Canal.—It is on Vina ranch, in the southern part of the county, at about 240′ altitude. It is 4 miles long, 30′ wide on top, 20′ on bottom, and 4′ deep. The water is diverted from Deer Creek, and irrigates 1,000 acres of alfalfa. T. J. Swing, of Vina, superintendent.

Trinity County.

Barmen Ditch.—It takes water from East Fork of Stewart's Fork—a second right. The ditch is 4′ on top, 2′ on bottom, 2′ deep, and 7 miles long, with capacity of 500 miner's inches.

Bloss & McClary Ditches.—These ditches take water from Swift Creek; the higher one is 8 miles long, 5′ on top, 2½′ on bottom, and 2½′ deep, carrying 1,000 miner's inches, and is used for piping; the other is 2 miles long, 7′ on bottom, 3½′ deep, and carries 3,000 miner's inches.

Brown's Creek Ditch.—It takes water from Brown's Creek, and is 6 miles long, 5′ on top, 2½′ on bottom, 2′ deep, with a 6′ grade per mile, and carries 500 miner's inches.

Conner Creek Ditch.—It takes the water from Conner Creek, and is 1 mile long, 6′ on top, 3′ on botttom, 2′ deep, and carries 1,000 miner's inches.

Cox Bar Ditch.—It takes water from Cox Bar Creek, is 2 miles long, 7′ on top, 3′ on bottom, and 2′ deep, and carries 1,000 miner's inches.

Coyle's Ditch.—It takes water from Swift Creek, and is 2 miles long, 5½′ on top, 3′ on bottom, 2½′ deep, with a capacity of 1,500 miner's inches.

Hayes Ditch.—It takes water from Cañon Creek, and is 12 miles long, 7′ on top, 4′ on bottom, and 3½′ deep, with a 9.6′ grade per mile, and capacity of 3,000 miner's inches.

Dutch Creek Ditch.—It is 1 mile long, 6′ on top, 3½′ on bottom, and 3′ deep, with a capacity of 1,000 miner's inches.

French Creek Ditch.—It is 6 miles long, 7′ on top, 5′ on bottom, and 3′ deep, with a grade of 9.6′ to the mile, and a capacity of 2,500 miner's inches.

Grass Valley (Frye) Ditch.—It takes water from Grass Valley Creek, and will be 11 miles long, but only 8 miles are completed. It is 6′ on top, 3′ on bottom, and 2′ deep, with a 9.6′ grade per mile, and capacity of 1,500 miner's inches.

Haskins Ditch.—It takes water from Buckeye Creek, and is 5 miles long, 4′ on top, 2′ on bottom, and 2′ deep, with a capacity of 600 miner's inches.

Howe Ditch.—It takes water from East Weaver Creek, and is 4 miles long, 8′ on top, 4′ on bottom, and 3′ deep, with a grade of 26′ to the mile, and a capacity of 4,500 miner's inches.

Hubbard Ditch.—It takes water from Reading Creek, and is 8 miles long, 6′ on top, 3′ on bottom, and 3′ deep, with an 8′ grade per mile, and capacity of 600 miner's inches.

Indian Creek Ditch.—It is 3 miles long, 7′ on top, 3½′ on bottom, 2½′ deep, and carries 1,000 miner's inches of water.

Junkans Ditch.—It takes water from East Weaver Creek, and is 8 miles long, 7′ on top, 4′ on bottom, and 2′ deep, with a 6′ grade per mile, and capacity of 1,000 miner's inches.

La Grange Ditches.—The first takes water from Rush Creek at present, but will be extended to Stewart's Fork. It is 16 miles long, 7′ on top, 3½′ on bottom, 4′ deep, with a 14.4′ grade to the mile, and a capacity of 3,500 miner's inches. The second ditch diverts water from West Weaver Creek, and is 4 miles long, 6′ on top, 3½′ on bottom, 3′ deep, with a 9.6′ grade per mile, and a capacity of 2,500 miner's inches.

McGillivray Ditch.—It takes water from Cañon Creek, and is 12 miles long, 7′ on top, 3′ on bottom, 3′ deep, with a 10′ grade per mile, and a capacity of 3,000 miner's inches.

Meade Ditch.—It takes water from the East Fork of Stewart's Fork (second right), and is 2 miles long, 4′ on top, 2′ on bottom, and 2′ deep, with a capacity of 600 miner's inches.

Murphy & Madison Ditch.—It diverts water from Mill Creek, and is 1½ miles long, 5′ on top, 2½′ on bottom, and 2½′ deep, with a capacity of 600 miner's inches.

North Star Ditch.—It takes water from the East Fork of Trinity River, and is 3 miles long, 6′ on top, 3′ on bottom, and 2′ deep, with a capacity of 500 miner's inches.

Paulsen Ditch.—It diverts water from Rush Creek, and is 4 miles long, 5′ on top, 3′ on bottom, and 2′ deep, with a capacity of 1,000 miner's inches.

Rush Creek Ditch.—It takes water from Rush Creek, and is 11 miles long, 5′ on top, 4′ on bottom, and 2′ deep, with a capacity of 6,000 miner's inches.

Sidney Hill Ditch.—It takes water from West Weaver Creek, and is 2 miles long, 6′ on top, 3′ on bottom, and 2′ deep, with a capacity of 1,000 miner's inches.

Tulare County.

The artesian belt principally lies W. of the S. P. R. R. and of Tagus Station. Its eastern boundary conforms approximately with the 280′ contour line. There are 100 or more flowing wells in the county which are 7″ to 9″ in diameter, 275′ to 700′ deep, and flow 1″ to 6″ over the casing. They furnish vast quantities of water for domestic, stock, and irrigation purposes. A number of wells typical of this area are described in our XIth Report, pp. 485–489. The strata penetrated are clay, separated by thin beds of sand and gravel, from which the flowing water is obtained. The impervious blue clay overlying the water-bearing strata throughout the artesian belt of the San Joaquin Valley varies in thickness and character. It thins out eastward near the railroad, dips a very little westward, and is in places 250′ thick, overlaid by alternating layers of clay and sand. It is said to grade into "tough blue sand," 500′ thick, in T. 23 S., R. 23 E., and very difficult to bore through. A yellow, sandy clay, with thin beds of water-bearing sand, is prevalent, overlying the blue clay toward the western boundary of the county.

Water for irrigation in the valley is obtained from streams flowing into it from the Sierra Nevada Mountains in the eastern part of the county, and from both flowing and pumped wells.

Merking's, Henry, Well.—It is in Sec. 30, T. 21 S., R. 24 E., and is 9″ in diameter, 555′ deep, and flowed, when completed, 1″ over the casing. It was recently bored deeper, and flows much less than others in that township. Ten strata of water-bearing sands were penetrated, each furnishing a very limited quantity. A 245′ bed of blue clay was struck at a depth of 250′.

Tulare Irrigation District Canals.—The two branches divert water from St. John's River, in Sec. 10, T. 18 S., R. 26 E., and Kaweah River, in Sec. 21, T. 18 S., R. 26 E., and unite in Sec. 23, T. 18 S., R. 26 E., and form the main canal, with a capacity of 1,000 cu. ft. per second, which is 3 miles long to a point whence the distributing branches diverge. There are about 33 miles of canal, trunk and branches, which have a general southwest course; and 38,000 acres are included in the district, which was organized under the "Wright law." James Akin, of Tulare, superintendent.

The following ditches divert water from the Kaweah River, near Visalia. They have a combined capacity of 400 cu. ft. of water per second, and irrigate land in fifteen townships:

Burch.
Buckley, C. F.
Curtis.
Deep Creek Ditch Co.
Elk Bayou Ditch Co.
Evans.
Evans Extension Ditch Co.
Farmers Ditch Co.
Fleming.
Fulgham Ditch Co.
Goshen or North Prong.
Hauch.
Hyde & Daggett.
Jenning's.
Kelly Ditch Co.
Lakeside Ditch Co.
Modoc.
Oakes.
Packwood Canal Co.
People's Ditch Co.
People's Consolidated Ditch Co.
Persian.
Riparian Owners Ditch Co.
Steinman & Kincaid.
Tulare Irrigation Co.
Tulare Irrigation District.
Uphill.
Watson.
Watson Extension Ditch Co.

The following ditches divert water from the Tule River near Porterville. They have a combined capacity of about 800 cu. ft. of water per second, and irrigate about 200,000 acres of land:

	Capacity, in Cubic Feet.
Aikens	3
Campbell & Moreland Ditch Co.	20
Daunts	2
Duncan	4
Gillam	3
Hockett Ditch Co.	10
Lewis	3
Milo	6
Mount Whitney Ditch Co.	10
Osborn & Graham	6
Pioneer Ditch Co.	72
Pleasant Valley Ditch Co.	10
Porter Slough Ditch Co.	40
South Side Ditch Co.	300
Tule River Irrigation Co.	300
Wilcox	5
17 small ditches out of South Tule River	17

Tuolumne County.

Tuolumne Ditch.—This ditch is 20 miles long, and has a capacity of 2,500 miner's inches, the water being taken from the South Fork of the Stanislaus River. It is distributed to mines about the northern part of the county, being employed chiefly as a source of power, though also in some small placer mining operations. Tuolumne County Water Co., of Columbia, owner; J. B. Pownall, of Columbia, superintendent.

Ventura County.

CANALS OF VENTURA COUNTY. (See map, p. 564.)

Name of Canal.	Point of Diversion.	Length of Main Line.	Size of Canal.	Capacity, in Miner's Inches.	Owner.	Address.
1. Atmore	Sespe River, near its junction with the Santa Clara River.	2 miles.		200	M. Atmore	Fillmore.
2. Camulos	Santa Clara River, near Camulos	2 miles.	6′ x 2′	700	R. Del Valle et al.	Camulos.
3. Carmichael	Fish Slough, near the junction of the Sespe and Santa Clara rivers.	3 miles.		500	F. Carmichael	Santa Paula.
4. Farmers	Santa Clara River, between Fillmore and Santa Paula.	6 miles.	6′ x 2′	700	Farmers Ditch Co., W. C. Richmond, Secy.	Santa Paula.
5. Fillmore	A cienega on north bank of Santa Clara River, near Fillmore.	3 miles.	3′ x 2′	300	Fillmore Ditch Co., F. Bates, Secy.	Los Angeles.
6. San Antonio Water Co.	San Antonio Creek, Ojai Valley	1 mile.	Flm., 10″ x 9″	80	San Antonio Water Co.	Nordhoff.
7. Miner	Ventura River, between Rice and Sheldon ditches.	1 mile.	2′ x 1′	150	J. Miner	Nordhoff.
8. Piru	Piru Creek	2 miles.	4′ x 2′	500	Piru Ditch Co., L. Gay, [Secy.	Piru.
9. Rice	Ventura River, at Matilija	2 miles.	24″ x 16″	250	R. Rice	Ventura.
10. Santa Ana Water Co.*	Ventura River, junction of Casitas Ck.	Flume, 7 mi.	Flm., 7′ x 2′	1,500	G. W. Chrismen, Pres.	Ventura.
11. Santa Clara Irrigation Co. (Hueneme).	Santa Clara River, at Punta de la Loma.	8 miles.	8′ x 3′	1,500	J. G. Hill, Pres.	El Rio.
12. Santa Paula W. W. Co. †	Santa Paula Creek, near Mapue S. H.	2 miles.	3½′ x 1′	375	C. H. McKevett, Secy.	Santa Paula.
13. Sespe L. & W. Co. ‡	Sespe River, near mouth of Sespe Cañon.	2 miles.	5′ x 2½′	500	F. Bates, Secy.	Los Angeles.
14. Sheldon	North Fork of Ventura River	2 miles.	16″ x 12″	80	Sheldon	Matilija.
15. South Side Improvement Co.	Santa Clara River, near Fillmore	5 miles.	12″ to 8′ x 3′	1,500	J. R. McKee, Secy.	Bardsdale.
16. Vineyard Water Co.	Santa Clara River, ½ mi. W. of Hueneme.	3 miles.	5′ x 2′	400	G. C. Powers, Manager	Ventura.
17. Williams, Bard & Spear	Santa Clara River, E. of Fish Slough	3 miles.	6′ x 2′	400	J. R. McKee, Secy.	Bardsdale.
18. Barrows & Howe	North Fork of San Antonio Creek	3,500 feet.	Flume 3″ x 6″	20	Barrows & Howe	Nordhoff.
19. Hargrave & Comfort	Near mouth of Piru Creek	2 miles.	Flm., 15″ x 16″	270	Hargrave & Comfort	Piru.
20. Stringtown Ditch	Near center of Sec. 32, T. 4 N., R. 19 W., S. B. M.	2 miles.	4′ x 1′	200	S. S. I. Co. et al.	Bardsdale.
21. Peralta Ditch and Flm.	On Mapue Creek	4,100 feet.	Flm., 12″ x 16″	200	Inlio Peralta	Santa Paula.
22. Beckman Ditch	Cuyama River	¾ mile.		90		Cuyama.
23. Dorn	Cuyama River	1 mile.		90		Cuyama.
24. Wagner	Ventura River, ½ mile above town	Flm., ½ mi.	16″ x 12″	75	J. B. Warner	S. B. Ventura.
25. Dubbins	Ventura River, 1 mile above town	1 mile.	24″ x 12″	100	Mrs. Dubbins	S. B. Ventura.

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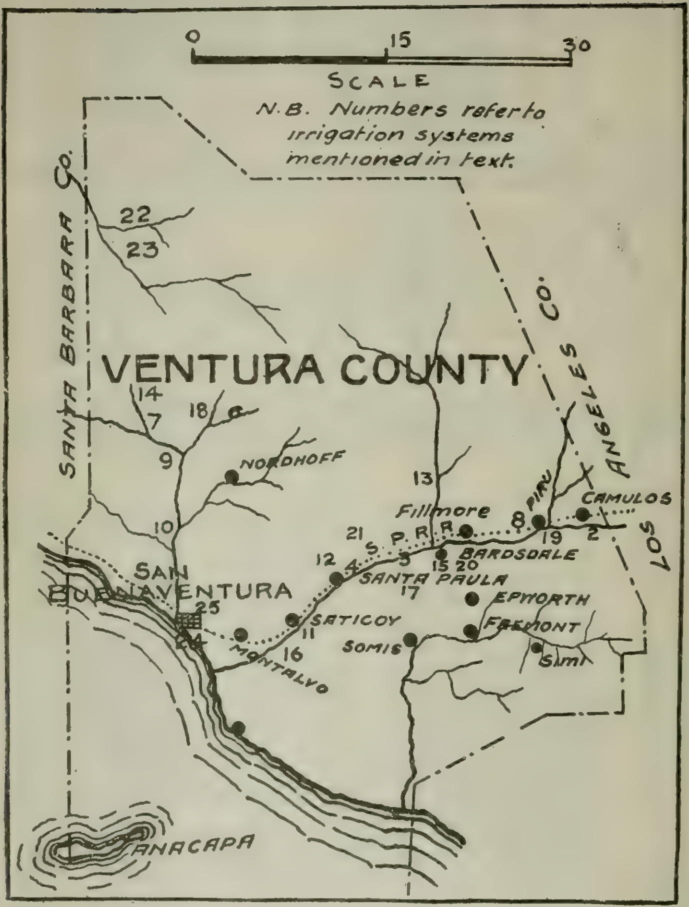
*This system supplies Ventura (City) with water. †This system supplies the town of Santa Paula with water. ‡Grade 10 feet per mile.


0
15
30
SCALE
N.B. Numbers refer to irrigation systems mentioned in text.
SANTA BARBARA CO.
VENTURA COUNTY
LOS ANGELES CO.
22
23
14
7
18
6
9
NORDHOFF
13
Fillmore
S. P. R. R.
8
PIRU
CAMULOS
19
2
21
10
12
4
3
15
20
BARDSDALE
SANTA PAULA
17
EPWORTH
SAN BUENAVENTURA
25
24
SATICOY
11
16
MONTALVO
SOMIS
FREMONT
Simi
ANACAPA
1

Yolo County.

This county possesses excellent advantages for irrigation and water-power. The torrential streams, especially Putah and Cache creeks, carry vast quantities of water where they enter the Sacramento Valley, which could easily be utilized for both power and irrigation, though they are yet but little improved. The subterranean supply of water which may be obtained in the valley by pumping is said to be almost inexhaustible; for a full description see our Xth Report, pp. 773–780. Flowing wells are obtained 1 to 2 miles E. of Woodland at a depth of about 150,, and water is pumped for irrigation purposes from non-flowing wells about Woodland.

Adams', D.Q., Ditch.—It diverts water from the north side of Cache Creek, near Capay, and is 4 miles long, 16′ wide on top, 8′ on bottom, 3′ deep, with a capacity of 20 cu. ft. per second. It is used for irrigating lands of the Adams estate.

Capay (Cottonwood) Ditch.—See our Xth Report, p. 792. It diverts water from Cache Creek, 3 miles above Capay, and irrigates land between Cache and Putah creeks, beginning at the foothills and extending eastward. It is now idle, pending litigation. G. W. Stephens, of Woodland, manager.

Capay Valley Ditch.—See our Xth Report, p. 793. It is in the upper end of Capay Valley. Idle, pending litigation. Spring Valley Water Co., owner.

Dinsdale's, J. A., Well.—It is 2 miles E. of Woodland, and is 6″ in diameter, 148′ deep, and flows enough water for stock purposes. The strata penetrated are alternating beds of clay and sand.

Woodland Irrigation Co.'s (Moore) Canal.—See our Xth Report, p. 792. It diverts water from Cache Creek, 8 miles W. of Woodland, and courses eastward. The main canal is 8 miles long, 35′ wide on top, 20′ on the bottom, 6′ deep, with a grade of 3′ to 9′ per mile; its capacity is 432 cu. ft. per second. Used for irrigating a large area of alfalfa, fruit, and vegetables. C. A. Brown, secretary; R. E. Moore, of Woodland, superintendent.

Yuba County.

The valley lands are well watered, and a large supply may be had at no great depth, if pumping is resorted to. No very deep wells have been bored to develop artesian flows. The deepest is a 560′ well at Wheatland, the bottom of which is in a heavy bed of blue clay. A supply may be had in most parts of the valley at a depth of about 20′, but better water is obtained at 50′ to 100′. See our XIth Report, pp. 515-516.

Brown's Valley Irrigation Canal.—It is located in the lower foothills of the county, at about 300′ elevation, and takes its water from the North Yuba River, on which it has a water-right of 10,000 miner's inches. The main canal is 27½ miles long, 5′ on the bottom, and 3′ deep, with a grade of 12.8′ per mile. The capacity is 5,200 miner's inches in the upper portion and 3,000 inches in the lower portion. With all branch ditches the entire length is 100 miles, controlling 44,328 acres of agricultural land, in a rolling country. An incorporated company, owner; T. J. Hibbert, of Brown's Valley, superintendent.

Excelsior Water and Mining Co.—This company's main canal starts from the South Yuba River, 3 miles below Purdan's bridge, and is 36 miles long, conveying 3,000 inches of water to Smartsville. The dimensions of the canal are 9′ on top, 6′ on bottom, and 2½′ deep, with a 10′ grade per mile. The company has branch ditches taking water from Deer Creek, in Nevada County; the first is 5′ on top, 2½′ on the bottom, and 2′ deep, with a grade of 15′ per mile, and a capacity of 500 miner's inches, delivered at Rough and Ready; the second takes water from Deer Creek through a 16-mile ditch to Newtown, being 4′ on top, 2′ on bottom, and 2′ deep, with a 16′ grade per mile, and of 400 inches capacity. Two miles N. of Rough and Ready another of the company's ditches takes water from Deer Creek, and is 18 miles long, 7′ on top, 5′ on bottom, and 2′ deep, with a 15′ grade per mile, and a capacity of 1,200 miner's inches. Still due N. from Rough and Ready, the company has another ditch, taking water also from Deer Creek; it is 14 miles long, 6′ on top, 4′ on bottom, and 2′ deep, with a 20′ grade per mile, and 1,000 miner's inches capacity. In connection with the water-rights, the property controls 30,000 acres of land. Dr. Ayer's Estate, of Boston, Mass., owner; W. Halstead, of Smartsville, superintendent.

Marysville Water Co.'s Wells.—There are two wells at the waterworks, each 12″ in diameter. One, known as the sulphur well, is 80′ deep, and the other, known as the soda and iron well, is 180′ deep. About 1,000,000 gals. are pumped daily from the two wells. Alternating strata of sand and clay, in horizontal layers, are penetrated. A limited quantity of gas rises with the water. The following analysis of water from the two wells was made by W. T. Wenzell, of San Francisco, March, 1893:

	Grains per U. S. Gallon.
Sodium carbonate	2.827
Sodium chloride	4.425
Sodium sulphate	0.326
Calcium carbonate	3.422
Magnesium carbonate	5.497
Ferrous carbonate and alumina	0.254
Silica	1.684
Potassium chloride	Trace.
Loss	0.193
Total solids	18.628

The following sanitary analysis was made by Prof. George E. Colby, of the State University at Berkeley, December, 1892:

	Grains.
Total solid residue, per gallon	21.600
Chlorine	1.800
Ammonia, free	0.013
Ammonia, albuminoid	0.088

NATURAL GAS.

Kings County.

Natural gas is said to have been struck in a number of artesian wells near Tulare Lake, but it is not utilized.

Jacobs', E., Wells.—Gas was struck in three or more wells on the Jacobs ranch, in T. 20 S., R. 20 E., at depths of 191′ to 275′.

Lamberson's, C. G., Well.—It is in Sec. 12, T. 22 S., R. 22 E., and gas was struck at 470′ to 485′ from the surface.

Marin County.

Gas escapes from the reef at Point Bolinas, which burns with a smoky red flame. The rock is a hard clay shale or indurated clay.

Sacramento County.

Sacramento Natural Gas and Water Co.'s Wells.—See our XIIth Report and Bulletin No. 3, pp. 350 and 11–13. This company bored two wells in the southwestern part of the city, which are 7″ and 14″ in diameter, 876′ and 965′ deep, and which flowed a large quantity of natural gas and mineralized artesian water when completed. Neither water nor gas is now utilized. J. Bassett, of Sacramento, manager.

San Joaquin County.

No new wells have been completed since our last Report, though one has been started in the northern part of the city. The yield of gas from the old wells is said to remain unchanged. The quantity is sufficient to materially reduce the fuel and lighting expenses in the city. See our VIIth, VIIIth, Xth, and XIIth Reports and Bulletin No. 3, pp. 181, 560, 556, 350, and 15.

Asylum Wells.—See our Xth and XIIth Reports and Bulletin No. 3, pp. 559, 350, and 18. These two wells yield gas for fuel and illumination. Preparations are being made to pump water from one of them with a 12″ centrifugal pump, with a view of increasing the quantity of gas. The water has 88° F. temperature, and is used only for bathing. See our Xth Report, p. 549, for analyses of the water. Dr. Clark, of Stockton, superintendent.

Central Natural Gas Co.'s Well.—See our XIIth Report and Bulletin No. 3, pp. 350 and 19. It is on the corner of American Street and Miner Avenue. It is 13″ in diameter, 1,500′ deep, and has a light flow. H. Greenway, of Stockton, superintendent.

Citizens Natural Gas Co.'s Well.—See our XIIth Report, and Bulletin No. 3, pp. 351 and 19. It is in Stockton, and is 2,061′ deep, and yields 42,000 cu. ft. of gas daily. H. C. Keys, of Stockton, superintendent.

Court-House Well.—See our VIIIth, Xth, and XIIth Reports and Bulletin No. 3, pp. 558, 560, 351, and 15. It is near the jail in Stockton, and is 12″ in diameter at the top, 1,917′ deep, and yields 30,000 cu. ft. of gas daily.

Crown Mills Well.—See our VIIth and Xth Reports, pp. 182 and 559. It is at the flour mill in Stockton. It is 9″ in diameter, 1,330′ deep, and yields 7,000 cu. ft. of gas daily, which is used for fuel and illumination. J. M. Welsh, of Stockton, superintendent.

Grant-Street Well.—See our Bulletin No. 3, p. 19. It is on Fremont and Grant streets. It is 12″ in diameter, 1,640′ deep, and yields 3,500 cu. ft. of gas daily. Stockton Gas and Electric Co., owner; H. E. Adams, of Stockton, superintendent.

Jackson Wells.—See our XIIth Report and Bulletin No. 3, pp. 351 and 17. They are at the Jackson Baths, Stockton, and are 12″ in diameter and 1,400′ and 1,655′ deep. The gas is sold to Stockton Gas and Electric Co. John Jackson, owner; Frank Hopkins, of Stockton, superintendent.

Lathrop Well.—See our Xth Report and Bulletin No. 3, pp. 560 and 19. It is near Lathrop. It is 8″ in diameter, 1,420′ deep, and is said to yield 2,500 cu. ft. of gas and 300,000 gals. of water daily. Not used now. Robert Shannon, of San Francisco, owner.

Northern Natural Gas Co.'s Well.—See our Xth Report, p. 558. It is in the northern part of Stockton. It is 13″ in diameter, said to be 2,000′ deep, and yields 29,000 cu. ft. of gas and a large quantity of water daily. George Harnage, of Stockton, secretary.

Roberts Island Well.—See our Bulletin No. 3, p. 19. It is on Roberts Island, 14 miles W. of Stockton. It is 7″ in diameter, 1,435′ deep, and yielded gas and water. Closed.

Salmon's, Cutler, Well.—See our VIIth Report and Bulletin No. 3, pp. 182 and 19. It is 7 miles S.E. of Stockton. It is 7″ in diameter, 1,250′ deep, and yields a large quantity of water and gas. The gas is used for fuel and illumination.

St. Agnes College Wells.—See our Xth and XIIth Reports and Bulletin No. 3, pp. 560, 351, and 18. These two wells are located in Stockton. They are 10″ in diameter, 960′ and 1,720′ deep, and yield more than 25,000 cu. ft. of gas daily, which is used for fuel and illumination.

Stockton Gas and Electric (Natural Gas and Gas Light and Heat) Co.'s Wells.—See our Xth and XIIth Reports and Bulletin No. 3, pp. 557, 351, and 18. This company was organized by consolidating the two old companies, and owns the "Haas wells," Nos. 1 and 2, the "Stockton Gas Light and Heat Co.'s well," and the "Grant-Street well," which has recently been extended to a depth of 1,640′. These four wells are said to yield 164,000 cu. ft. daily. The company also receives gas from the two wells at the Jackson Baths. They are all fully described in the above Reports. This company is sinking a 12″ well, at the corner of Hunter and North streets, which was 200′ deep in September, 1895. A. T. Eastland, of Stockton, secretary; H. E. Adams, of Stockton, superintendent.

Santa Barbara County.

In Summerland there are several wells which supply gas for fuel to the residents. The most remarkable feature about them is the pressure of the gas at comparatively shallow depths. Thus, in a 104′ well "at times the pressure was so great that mud and dirt were thrown from the well 40′ or more into the air." See our Xth Report, p. 601. The rate at which the pressure decreased can be gathered from the record of the following wells:

Cone's Well.—Two 2½" wells, 125' deep, are about 100' N. of the Doulton oil wells and N. of the railroad. In 1893, when first drilled, they supplied twenty families with fuel, but in 1895 they yielded sufficient gas for three families only. N. Cone, of Summerland, owner.

Darling Bros.' Well.—Two 2" wells, 102' deep, are about 1,200' N.W. of the railroad. One of them was drilled in 1891, and when completed the gas showed a pressure of 8 lbs. per square inch, and for a year it supplied seventeen families with fuel. The pressure gradually diminished, and in 1895 it was only 1 lb. per inch. The other was completed in 1892, and has a similar record. In August, 1895, it required both of these wells to supply ten families. It is stated that during a north wind these wells yielded a strong flow of gas, but when the wind subsides the gas ceases to flow and a current of air is drawn down the well for several hours. In one instance the latter phenomenon was noticed to continue for two days, before inflammable gas again flowed from the well. Darling Bros., of Summerland, owners.

There are several other wells in Summerland which are said to yield enough gas to furnish more than one family with fuel.

Santa Clara County.

New Almaden.—See our XIIth Report, p. 407. Carbonic acid gas (CO_2) is obtained in large quantities in a drift on the 575' level in Santa Isabel shaft, at New Almaden. It is drawn through a pipe to a receiver, from which it is charged into steel cylinders, under a pressure of 1,300 lbs. to the square inch, and shipped for use in charging mineral waters, ales, etc. Eight hundred thousand cubic feet were shipped in 1895. California Natural Carbonic Acid Gas Co., of San José, lessee; H. C. Fister, secretary; G. W. Meyer, superintendent.

Solano County.

Gas occurs in the vicinity of Potrero Hills, in a bored well, and also escapes with water from numerous springs in the tide-water lands. See our Bulletin No. 3 and Xth Report, pp. 5 and 660.

Allen's, M., Ranch.—It is in Sec. 2, T. 4 N., R. 1 W., 7 miles E. of Suisun, at tide level. Natural gas escapes with water from twenty or more places. Not utilized.

Hilborn's, E. P., Well.—It is in the head of a narrow anticlinal valley in the Potrero Hills, 4 miles S.E. of Suisun. It is 8" in diameter, 100' deep, and said to flow 2,400 cu. ft. of gas daily. When lighted at the mouth of the well it burns constantly. The strata penetrated are principally sand, which fills the valley; the hard underlying shales were not reached. The gas is not utilized.

Hurley's, Mrs. M., Ranch.—It is in Sec. 24, T. 5 N., R. 1 W., 6½ miles E. of Suisun. A large quantity of gas is said to come up with water in a number of places, but is not utilized. James Keyes, of Suisun, manager.

Tulare County.

A number of artesian wells near Tulare Lake, in the southwestern part of the county, yield a limited quantity of natural gas. See our XIth Report, p. 486, and Bulletin No. 3, p. 20.

PETROLEUM.

Alameda County.

Haywards.—At an early day oil was discovered in Palomares Cañon. A 20′ shaft was sunk 6 miles N.E. of Haywards; salt water and a dark-colored oil raised nearly to the top of the well, both of which disappeared after the 1868 earthquake.

Livermore.—See our VIIIth Report, p. 25. Indications of petroleum have been known for many years in Sec. 26, T. 2 S., R. 2 E., about 4 miles E. of Livermore. The earthquake of 1868 caused a spring to flow near the point of disturbance, and the water contained traces of petroleum and considerable gas. A 10′ hole was bored this spring, and it is said that a black viscous oil flowed in such quantities that a 5-gal. can could be filled in two hours. It seems then to have been abandoned. In 1875 prospecting was recommenced and a 59′ well bored. At 45′ water and oil were encountered, and continued to flow until the uncased well caved. In 1886 the Alameda Oil and Gas Co. bored a well 165′ deep a few yards north of the first prospect, and obtained water and some oil. The well was then continued to 208′, but no increase was obtained. This well still affords a little water, oil, and gas. The formations passed through are as follows:

Soil	5′
Sandstone	160′
Conglomerate	43′
Sandstone	Undetermined.

These formations dip S.W. at an angle of 30°. The Livermore Oil Co. bored a 350′ well 8 miles E. of Livermore; no practical results.

During the past twelve months a renewal of the oil interest has been manifested in this vicinity. On J. Brown's place, 4½ miles N.W. of Livermore, at 600′ elevation above the sea, a well was started about 100 yds. E. of the former well, which had reached a depth of 208′, and sunk 26′; both gas and water, carrying a black, oily scum float, was obtained; the formation passed through was a coarse-grained sandstone, the same as in the former well. On J. Barry's place, adjoining, a well has been sunk 65′, through sandstone, which shows gas, but no black oil. On Mrs. Ford's place, 1½ miles W. of Brown's, a former well that gave indications of oil, but which had been allowed to cave, has been partly cleaned out and a new well started, but not carried to any result.

Colusa County.

Long's Claim.—It is in the S.E. ¼ of Sec. 27, T. 14 N., R. 5 W. Petroleum seeps from shales, which dip at a steep angle, in a ravine tributary to Bear Creek. Preparations are being made to develop the property. M. A. Long & Son, of Williams, owners.

Rathburn's Claim.—See our Bulletin No. 3, pp. 6 and 89. It is about 1 mile E. of Long's oil claim, in Sec. 26, T. 14 N., R. 5 W. Oil seeps from a number of places near the contact of serpentine and metamorphosed shale. Shallow cuts have been made to collect the oil, and it is said a barrel has been collected daily, but no systematic development has been done. J. P. Rathburn & Son, of Williams, owners.

Contra Costa County.

Bituminous formations are exposed at several places; one is on the ranch of J. Miner, about ½ mile E. of De la Viaga station, on the C. & N. R. R. Here the bituminous shale is exposed in the bed of the Louterwasser Creek, and it is overlaid by a light-colored sandstone, in which there are brine springs and traces of petroleum.

A reconnoissance up the Louterwasser Creek shows that the prevailing dip of both the shale and sandstone is to the eastward. The following wells are in this vicinity:

Chandler's Well.—It is on the Miner ranch and on the south bank of the Louterwasser Creek; it was drilled in 1889, penetrated the bituminous shale to a depth of about 200′, and is said to have yielded a small quantity of heavy oil and water. Abandoned.

Cummings' Well.—It is on the Miner ranch, about ¼ mile E. of the Chandler well. This well was bored by a core drill machine in 1895, and penetrates 20′ of saturated shales, and then sandstone. It is said to be over 300′ in depth, and that traces of petroleum were found. Abandoned.

Sonntag's Well.—It is on the Allen ranch, about ½ mile E. of the Cummings well. On August 20, 1896, it had reached 100′ in depth; the formation penetrated is light-colored sandstone. Charles Sonntag, of San Francisco, lessee.

Fresno County.

Petroleum occurs in the foothills skirting the west side of the San Joaquin Valley. The Coalinga District is the only place prospected. Many claims were located, and active prospecting and boring recommenced in the spring of 1896. See our XIIth Report and Bulletin No. 3, pp. 352 and 56. A limited amount of petroleum flows from the old wells, with water, and is collected in a crude way and used for lubricating oil, etc.

A heavy, tar-like petroleum seeps from the side of a ravine 9 miles N. of Coalinga, and is collected in pits 2′ to 15′ deep. It is heated, strained, and sold for lubricating oil; 25 to 30 gals. are said to be collected daily. One man is employed. A. Barrean, of Selma, owner.

C. C. C. Oil Co.—Its claims comprise about 3,000 acres, and are situated in Sec. 17, T. 19 S., R. 15 E. Developments consist of a 750′ and a 650′ well. Each of them yields about 20 bbls. of oil in twenty-four hours. Canfield & Connon, owners; J. A. Connon, of No. 454 Beaudry Street, Los Angeles, secretary.

Producers and Consumers Oil Co.—Its claims comprise about 360 acres in Sec. 20, T. 19 S., R. 15 E. Developed by four wells; a 450′ one not pumped, and in which the oil stands within 40′ of the top of the casing; a 605′ one, which yields 20 bbls. in twenty-four hours, and one well which in June, 1896, was uncompleted. A 900′ one, which is said to have flowed a *great volume* of oil of low specific gravity for a short time after its completion; when the gas pressure lessened the well ceased to flow. It is stated that in July, 1896, this well yielded about 20 bbls. of oil a day. F. Barrett, of Selma, secretary.

Los Angeles County.

The most important mining operations in Los Angeles County are connected with petroleum; the total output for 1895 was 979,695 bbls., and the price realized was $732,817. The oil-fields which contributed to this total are situated at Los Angeles, Pico Cañon, Newhall, and in the Puente Hills.

LOS ANGELES OIL-FIELD.

The most important event in the annals of the petroleum industry of California for 1895–96 is the development of the Los Angeles oil-fields. At Los Angeles the rocky formations constitute a portion of the southern slope of an anticlinal fold, which appears to extend eastward from the Cahuenga Mountains. The axis of this fold, although rather ill-defined, can be found a short distance north of Elysian Park. The prevailing dip of the strata forming the south slope of this anticline is a little west of south, modified by subordinate folds or flexures, which, in some places, have locally inclined the strata in an opposite direction. There are two such flexures: one to the north and the other to the south of the oil wells at Second-Street Park. Owing to the alluvium covering the rocks, only glimpses of these lines of disturbance can be obtained, but a careful study of them leads to the conclusion that they can be traced as follows:

The most important line of disturbance can be traced with a course S. 55° E. from the corner of Vermont and First streets to a point a little south of First and Glassell streets, thence to a point on Quebec near Ocean View Avenue, and thence to another point about 300′ north of Fourth and Bixel streets. The other line of disturbance can be observed on Burlington near Temple Street. It can be traced to Temple Street near Lake Shore Avenue, and probably the disturbance of the formation near Bellevue and Victor streets is associated with it. A little disturbance can be noticed in the middle of the oil-field on Court near Toluca Street.

The rock penetrated by the oil wells at Second-Street Park consists of soft, thin-bedded sandstones and sandy clays and shales, which are interstratified by thin strata of impure limestone and calcareous strata, and two or more strata of oil-bearing sand. This formation is of the Pliocene age. The principal stratum of oil-bearing sand is about 150′ thick, and it crops out at the surface on Burlington Street, about 300′ N. of First Street. As a typical illustration of the character of the strata penetrated by the oil wells at Second-Street Park, Mr. Doheny states that a well drilled by the Doheny Oil Co., in the northeastern portion of the oil-field, pierces the following formation:

Sandy and clayey strata, with thin strata of hard rock	650′
Oil sand, interstratified with sandy clay	125′
Tough clay (putty)	200′
Oil sand, with water	3′
Sand, with water	Undetermined.

The oil sand is more than 100′ thick, the richest portion of it being about 45′ thick.

Fig. A represents a section across the west end of the oil-field at Second-Street Park. It shows the lines of geological disturbance to the north and south of the oil-field, the outcrop of the oil sand, and the point where it is penetrated by a well sunk by Mr. Garbutt, near the corner of First Street and Union Avenue. Up to April, 1896, this well was the farthest west of any productive well in the district. In this well the oil sand was struck at a depth of about 855′, which shows that at this end of the field the angle of the dip of the oil sand must be about 45°. This angle is very nearly that of the dip of the formation exposed near Mr. Garbutt's well, but more than that of the oil sand where it crops out at the surface of the ground on Burlington Street. On the right-hand side of the diagram is the southern line of disturbance, noticeable on Quebec Street. If this line is followed along its strike it would cross Western Avenue near Silver Street, which is a point

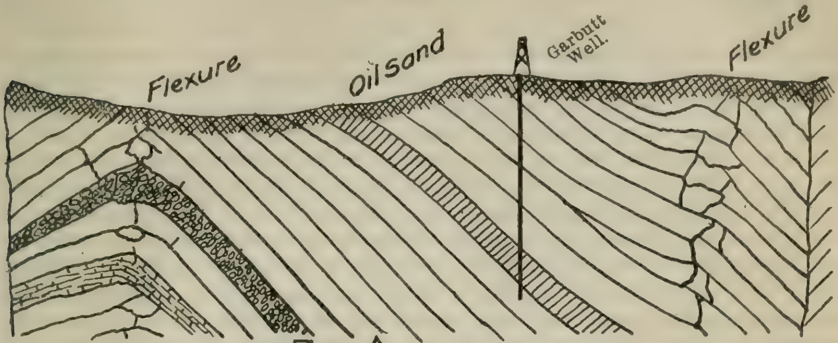


FIG. A.

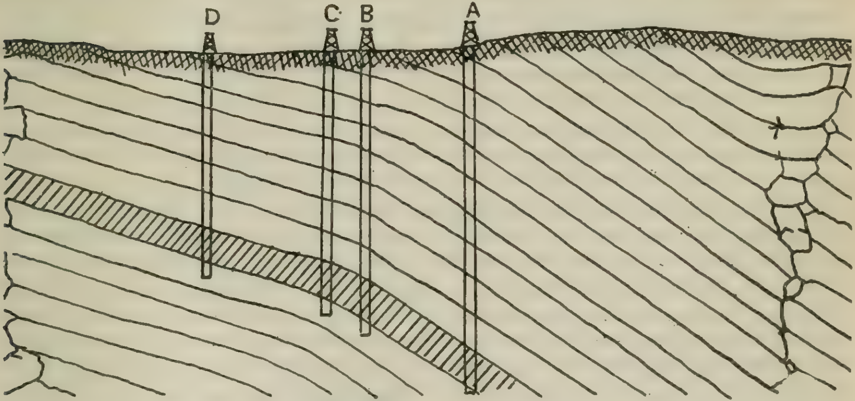


FIG. B.

A. Union Oil Co.'s well on First Street.
B. American Crude Oil Co.'s well.
C. Cole's well.
D. American Crude Oil Co.'s well.

shown in this diagram. It has been necessary to make the lines of disturbance well marked on this diagram, but on the surface of the ground they are merely indicated by strata dipping in opposite directions. On Burlington Street, about 300′ north of First Street, is the only place in the field where the oil sands crop out at the surface of the ground. The reason of this may be explained by Fig. B.

In well A, on the south side of First Street, the oil sand was struck at a depth of 1,010′. If a line be drawn from this well across the oil-field, and at right angles to the prevailing strike of the formation, which is S. 80° E., and if the wells nearest thereto, of which information could be obtained, are arranged at points where the strike of the strata they penetrate cross the line, the profile shown in Fig. B is obtained.

From oil sand in well A to oil sand in wells B and C, shows the dip to be at an angle of about 35°. From oil sand in well C to oil sand in well D, the dip shown does not exceed an angle of 16°. With the oil sand dipping at this low angle it could not come to the surface before reaching the line of disturbance noted in the north end of the field. In wells drilled along the northern and southern margins of the oil line, water has been troublesome and has prescribed the width of the oil-bearing territory. The operators in the Los Angeles oil-fields agree that the main stratum of oil sand thus far explored is from 100′ to 150′ thick, but that, as a rule, it is not productive all the way through. The general opinion of well-drillers appears to be that at least 40′, on an average, of the oil sand may be put down as "pay dirt."

Experiments have been made by Mr. Hawley, a civil engineer, as to the absorbent powers of this oil sand, and he states that he found that it would absorb about 10% of oil of 14° B. These figures agree very closely with experiments made in Eastern States on the absorbent powers of sand. Mr. Doheny also made some experiments on oil sand from the Maltman tract, and obtained higher results.

For the purpose of obtaining a concrete idea of the situation, which is within the range of probability, it may be tentatively admitted as follows: That the Los Angeles oil-field, as far as developments have shown, derives its oil from a stratum of sand carrying about 10% of oil; that the said stratum is about 40′ thick, and has an area of about four million square feet. Such a stratum would contain, in round numbers, about 2,850,000 bbls. of oil. A careful canvass of all the oil-producers shows that in 1895 the Los Angeles oil-field produced 729,695 bbls., or about one fourth of our theoretical total contents of the sand; and no inconsiderable amount was produced in 1894.

The question that naturally arises is, how much of the remaining 2,000,000 bbls. of oil can be obtained by pumping? There do not appear to be many factors on which to base an estimate. It must be borne in mind that it is a heavy oil; that the gas pressure in the Los Angeles wells was never very great. Therefore, the probabilities are that even after a well has ceased to yield enough oil to pay for pumping every day, providing the wells do not become filled with water or choked with sand, small quantities of oil might be pumped from them for quite a long period. Moreover, although there is such a forest of derricks at Second-Street Park, they are by no means uniformly distributed over the four million square feet which we, by the way of a rough estimate, put down as oil sand.

In the beginning of March, 1896, there were about 330 wells in the oil-field; allowing to each well, say five thousand square feet, as they were distributed at that date, it would seem that there must be more land in the area we calculated yet to be heard from. Much of the unbroken territory is covered by streets and buildings; all the better for the wells which are near them, but it seems probable that if a reasonable price can be maintained for the oil, wells will yet be sunk at Second-Street Park which may yield moderate returns. The question naturally suggests itself, cannot other strata of oil sand be found by drilling to a greater depth than has yet been reached? The experiment is worth trying, but the only wells which in April, 1896, had gone far below the main oil sand have encountered water. With the limitation of the Second-Street Park oil-field thus in sight, the question as to the extension of the oil-field becomes one of great moment, and the only plan is to follow the strike of the formation which has proved to be oil-producing. As indicated by the arrows in the geological sketch-map of West Los Angeles (see Bulletin No. 11), the prevailing dip of the formation as seen at the surface is S. 10° W., although there are numerous aberrations from that azimuth. The depth at which the oil sand was struck in the different wells leads to the conclusion that, in the main, the strike and dip of the oil sand are similar to that of the rocks exposed at the surface. The general direction of the oil line, as indicated by the productive wells, is practically E. and W. Disregarding any faults there may be in the rocky formation, which for the most part is covered by alluvium, an inspection of the geological map of West Los Angeles (see Bulletin No. 11) leads to the following conclusion: If the oil line on which Second-Street Park oil-field is situated be extended westward it would pass a short distance south of the Baptist University. Southwest of the university grounds a formation is exposed which corresponds very closely to that at Second-Street Park. This formation rests on a series of sandstones, several strata of which are oil-bearing. On the Maltman tract these sandstones, which show a thickness of several hundred feet, are penetrated by nine wells, ranging from 140′ to 285′ in depth. Each of these wells can be made to yield something less than 2 bbls. of heavy oil a day; in all the deeper wells water was encountered. It is evident, therefore, that the oil-yielding formations extend westward from the Second-Street Park oil-field. The only attempts that have been made to prospect the territory between the Second-Street Park and the Baptist University are as follows: The Fudicker well, situated south of First Street and near what would be Reno Street if it were graded; the Union Oil Co. well, situated south of First and west of Alvarado Street; one known as the old Dryden well, which is about 1,000′ N.W. of the preceding, and one sunk by Mr. Doheny, near the corner of First and Newhall streets. All of these wells proved unsuccessful, and are abandoned; the cause assigned for the failure of the first two being quicksand and water. Farther southward, near Westlake Park, is the Wilshire well, which was unsuccessful; and farther westward there are a few very shallow wells, the Ruhland, which have yielded small quantities of heavy oil. From the records of these wells the outlook to the westward does not seem encouraging. A careful inspection of the territory, however, leads to the conclusion that the Doheny and the Union Oil Co.'s wells are the only prospect wells mentioned that penetrate similar strata to those which yield the oil at Second-Street Park; that the Doheny well must be nearly on the outcrop of the oil sand, and that probably the well of the Union Oil Co. is not very far south of it.

There does not appear to be any reason why the oil-yielding formations should not be followed east from Second-Street Park, but between it and the river there are very few opportunities of examining the rocky strata. It is a noteworthy fact, however, that in the water wells which penetrate the drift near the Main-Street bridge, traces of oil contaminate the water.

The Brook and the Hoag & Silent wells, situated in the north edge of De Soto Heights, must be very nearly on the strike of the formation penetrated by the oil well at Second-Street Park, but they appear to be abandoned. It is said that heavy oil was obtained in the Brook well, but that it was impossible to case off the water without also casing off the oil. Several enterprising citizens have drilled wells in an endeavor to find other oil lands in the vicinity of Los Angeles, but without success; in nearly all these wells the strata penetrated showed small quantities of oil. It is said that the cause of failure, in most instances, was water and quicksand.

From the foregoing it appears that an extensive oil-yielding formation underlies a portion of Los Angeles; that up to date explorations outside of the Second-Street Park oil-fields have not been successful.

A review of the situation leads to the conclusion that the best results will be obtained by following the strike of the productive oil-yielding formation, rather than by sporadic prospecting. When a point is reached where the formation is broken, in the absence of any rock exposures to prove that the geological disturbance is other than local, several hundred feet should be passed over and prospecting be recommenced still in the direction of what had been previously proven to be the strike of the oil-yielding rocks. *Accurate drilling records should be kept, from which a profile of the oil-yielding strata might be made, and by which an engineer could trace the course of the oil sand.*

In view of the fact that the direction of the strike and the angle of the dip are somewhat irregular, the safest mode of procedure is to progress gradually, and not make too long jumps.

Asphaltum and Oil-Refining Co.—Santa Fe Railroad Avenue and Ninth Street. The plant consists of two stills of 125 bbls. each, one still of 50 bbls., and one still of 30 bbls. The product is asphaltum, lubricating oil, and distillate for fuel. Four men are employed. Theodore Clark, of Los Angeles, manager.

Bluett & Mullen.—Their oil claims comprise about 3,000 acres and are situated in the Palmoras Mining District, about 4 miles N. of Castac. One well was 400′ deep and incomplete in May, 1896. Bluett & Mullen et al., of No. 1 N. Spring Street, Los Angeles, owners; L. W. Johnson, manager.

Central Oil Co. of Los Angeles has leased 3,000 acres of land about 1 mile N. of Whittier. In April, 1896, one well had been drilled to a depth of 700′, penetrating, at a depth of 520′, a stratum of oil sand. W. W. Neuer, president; R. N. Bulla, No. 39 Temple Block, Los Angeles, secretary.

Oil Burning Supply Co.—Corner Date Street and Alhambra Avenue. The plant consists of three stills of 100 bbls. each, and storage-tanks of total capacity of 5,000 bbls. The product is distillate for fuel, asphalt, A B C D and liquid asphaltum, using for fluxing asphaltum which is used for roofing. Six men are employed. Harrington Brown, University P. O., Los Angeles, president.

Pacific Oil Refinery and Supply Co.—Its pipe-line extends from Second-Street Park oil-field to their tanks on Santa Fe Avenue. The plant consists of 1 mile of 6″ pipe, 4 miles of 4″ pipe, and ½ mile of 3½″ pipe. The tankage is 75,000 bbls. H. L. Williams, No. 332 Stimson Block, Los Angeles, president.

Pico Cañon Oil Wells are situated in what is commonly known as the Pico Cañon oil-field, which is about 7 miles from Newhall. There are about 35 wells in Pico Cañon, 1 in Elmira Cañon, and 1 in Wylie Cañon. These wells vary from 650′ to 1,700′ in depth. (See our Xth Report, p. 283.) The output of these wells during 1895 was about 150,000 bbls. The Pacific Coast Oil Co. and California Star Oil Co., of San Francisco, owners.

Puente Oil District.—The hills in which the Puente oil wells are situated are an extension of a line of elevation which can be traced in a southeasterly direction from the City of Los Angeles. These hills, as seen at the Puente oil wells, are formed by a series of folds in the rocky formation, which have an easterly and westerly trend. At the base of the Puente Hills soft sandstones and conglomerates are found, and in some places a white, chalk-like diatomaceous rock, similar to that seen at Los Angeles, alternates with reddish-brown, sandy strata, forming parti-colored banks in which the strata vary from a few inches to less than an inch in thickness. A small collection of fossils was obtained from these formations, which show a preponderance of Pliocene forms.

The higher portions of the Puente Hills are composed of both hard and soft sandstones and shales, and these rocks are often separated by hard, calcareous strata. Were it not for the latter it would be very difficult to learn much about the stratigraphy of the Puente Hills, for the soft rocks readily disintegrate and become covered with alluvium, while the hard, calcareous strata resist the action of the elements, and in many places afford the only clue to the dip of the formation. These harder rocks, and the sandstones and shales associated with them, appear to be older and are more disturbed than the soft sandstones and conglomerates at the base of the hills. The only organisms noted in these harder rocks are the bones and scales of fish and a few carbonized plant remains. There has been so much geological disturbance in the Puente Hills that it renders the locality an unfavorable one for estimating the thickness of the formations named, and prevents a definite conclusion as to the conformity or non-comformity of the older and more recent strata.

The Puente oil wells are situated on Puente Gulch, and are about 5 miles distant in a southwesterly direction from Puente Station on the S, P. R. R., and about 6 miles distant in a northwesterly direction from Fullerton, on the San Diego branch of S. P. R. R.

At Puente there are 35 productive wells, from 710′ to 1,750′ in depth. Their total output of oil for 1895 was 100,000 bbls. The oil from most of the wells has a gravity of from 25° to 30° B., and a few of them yield a heavy, tar-like oil. The productive wells are situated on the north and south sides of Puente Gulch. Our investigation leads to the conclusion that this gulch has been worn along the axis of an anticlinal fold. The prevailing strike of the oil-yielding strata appears to be N. 70° to 80° E.

Nearly 2 miles in a southeasterly direction from the Puente oil wells, is Brea Cañon, where there are other seepages of oil. Between these two places a spur of hills extends in a southwesterly direction. The highest point of this spur is about 100′ below the boarding-house at Puente, and about 300′ above the most western seepages of oil in Brea Cañon. Brea Cañon, like Puente Gulch, is worn along the axis of an anticlinal fold. On the northern side a formation is exposed which resembles a portion of the more recent Tertiary formations at Los Angeles. It consists of thin strata of soft, white, chalk-like diatomaceous rock, which alternate with thin strata of reddish-brown sand. This formation dips N. 17° E. at an angle of 35°. It appears to rest somewhat uncomformably on a soft sandstone containing numerous white particles. The soft sandstone rests on conglomerate, and the conglomerate on micaceous sandstone, which dip N. 25° E. at an angle of 65°. Both the white and red formation, the soft sandstone and the conglomerate, appear to rest nearly, but not quite, conformably on one another. On the south side of Brea Cañon are soft sandstones and conglomerates very similar to those last mentioned; they are more or less impregnated with petroleum, and dip S. 20° W. at an angle of 70°. A short distance farther south the dip is due south at an angle of about 40°.

Along the south side of Brea Cañon there is a series of seepages of heavy oil, which has a course of S. 78° E., and this direction conforms to that of the axis of the anticlinal on which the oil seepages are situated.

The brea, *i. e.*, impure asphaltum, and oil-soaked earth, which is exposed in Brea Cañon, have been used as fuel in the surrounding country. At one point an excavation has been made and a tunnel has been run a short distance in the brea. The excavation is filled with water, with heavy oil floating on it.

Several years ago two or three wells (the Chandler wells) were sunk about 4 miles S.E. of the Puente oil wells. They penetrate a formation similar to that seen in Brea Cañon, and are said to be 200′ or 300′ deep. In December, 1894, they appeared to be abandoned. They are said to have yielded 2 or 3 bbls. of heavy oil daily. Around the wells are seepages of heavy oil and deposits of brea. This brea can be traced from the Chandler wells, a distance of nearly 2 miles, to the most western oil seepages in Brea Cañon.

No one who has compared the geological formation in Brea Cañon and the oil-yielding formation in the western portion of Los Angeles can fail to notice their great resemblance in lithological character; but the collection of fossils from Brea Cañon indicates a somewhat greater age than does the collection made at Los Angeles. Puente Oil Co., of Baker's Block, Los Angeles, owner; W. R. Rowland, president; A. T. Graves, secretary.

Puente Oil Co.'s Refinery.—It is at Chino, San Bernardino County, and has a capacity of 200 bbls. of refined petroleum a day. The refined product consists of illuminating oil of 120° fire test, gasoline 72° B., benzine 58° B., and the residues, which are sold as fuel. Puente Oil Co., owner; A. T. Graves, Baker's Block, Los Angeles, secretary.

Standard Oil Co. of Pennsylvania have tanks, situated on Buena Vista Street, Los Angeles, and the S. P. R. R., of 45,000 bbls. capacity. J. C. Harve, of Los Angeles, agent.

Union Oil Co.—Its pipe-line extends from the Second-Street Park oil-field to Palmetto Street, on the So. Cal. R. R. The plant consists of 5 miles of 4″ pipe principally, and a tankage capacity of 32,000 bbls. L. Stewart, Byrne Building, Broadway, Los Angeles, president.

PETROLEUM STATISTICS OF LOS ANGELES COUNTY, 1895.

	Barrels.	Value.
Los Angeles oil wells yielded	729,695	$437,817 00
Puente oil wells yielded	100,000	100,000 00
Pico oil wells yielded	150,000	195,000 00
Totals	979,695	$732,817 00

TANKAGE.

	Barrels.
In the Second-Street Park field	70,000
Outside Second-Street Park field—	
So. Cal. Supply Co.	70,000
Union Oil Co.	32,000
Puente	6,500
Standard Oil	45,000
Oil Exchange	3,600
Hoffman & Weller	2,400
Pritchard & Co.	2,400
S. P. R. R. Co.	20,000
Total	251,900

The daily yield of oil during 1895 was rather more than 2,000 bbls.; during the first half of 1896 the daily yield was estimated approximately at 1,400 bbls.

STOCK OF OIL ON HAND AT LOS ANGELES.

	Barrels.
In the field, March 24, 1896	37,500
In the field, May 2, 1896	38,700
In the field, May 15, 1896	34,100
In the field, May 30, 1896	37,190
Outside the field, May 30, 1896	55,800

STATEMENT OF LOS ANGELES CITY OIL WELLS FOR THE YEAR 1895.

(As furnished by owners or agents.)

Name of Company.	Number of Wells.	Depth.	To First Sand.	Specific Gravity.	Product of 1895. Bbls.
Adams, H. B.	2	550′			700
Alderson, J. H., 1807 S. Hope Street	4	700		16.0° B	10,000
American Crude Oil Co., Byrne Building	5	770 to 925	730′ to 855	15.5° B to 14.5° B	30,000
Bayer & Last	6	700 to 800		15.0° B	25,000
Bayer & Benz	3	1,100 965 986		15.0° B	12,000
Beech, Young & Cochran, 260 Calena Ave., Pasadena	2	840 800	700 None.	 13.0° B	 100
Blunt, Mrs. Cora A., 149 Kern Street	1	977		14.5° B	1,200
Bosley & Co., G. W., 309 Figueroa Street	1	840	820		1,500
Brophy, Forst & Tabor, Edgeware and Omaha	2	742 765	715 690		5,000

Statement of Los Angeles City Oil Wells—Continued.

Name of Company.	Number of Wells.	Depth.	To First Sand.	Specific Gravity.	Product of 1895. Bbls.
Brophy, Morris & Blaisdell, care of Savings Bank and Trust Co.	2	805	665	----------	--------
		775	640	----------	4,000
Burns, John, Court Circle	2	950	----------	----------	--------
		880	----------	----------	20,000
Carbon Hill Oil and Coal Co., 338 South Broadway	1	911	900	13.5° B	None.
Chandler (new)	1	810	770	----------	--------
Cheney, W. H. E., 1532 Rockwood	1	955	600	16.0° B	1,200
Chicago Crude Oil Co., 309 S. Hope Street	2	----------	----------	----------	None.
Clark, J. R., 2433 Grand Avenue	1	700	350	18.0° B	1,800
Coe, E. W., care of L. A. National Bank	1	650	650	19.0° B	1,600
Cole, A., Belmont and First	2	900	825	15.5° B	3,000
Combination Oil Co., 1319 Omaha Street	4	----------	----------	----------	7,000
Consolidated Oil Co., 305 State	2	1,035	----------	14.0° B	7,000
		1,000	----------	----------	--------
Croswell Oil Co., 341 Edgeware	4	700	700	----------	--------
		750	750	----------	--------
		750	750	----------	--------
		906	750	16.0° B	6,000
Cullen, K. P., 213 Nolan & Smith Block	3	1,025	----------	----------	--------
		952	----------	----------	--------
		981	650	15.5° B	5,000
Daggett & Fletcher, 1342 Calumet Ave.	3	900	----------	----------	--------
		788	----------	----------	--------
		930	----------	15.0° B	5,000
Davis, Cook & Co., care Chamber of Com.	1	1,000	400	17.0° B	5,000
Davisson, Melice & Co., Byrne Building	2	830	----------	----------	--------
		835	730	15.5° B	7,000
Davis, Sloan & Beers, 320 Park Place	4	----------	----------	----------	1,500
Day, A. C., 826 Buena Vista	1	930	----------	14.5° B	3,000
Diamond Oil Co., 147 S. Broadway	3	----------	----------	16.0° B	5,000
Doheny-Connon Oil Co., Stimson Block	28	----------	----------	----------	100,000
Dryden, W., University Post Office	2	750	----------	----------	--------
		989	660	----------	6,000
Eagen, May & Mernier, 1525 Rockwood Ave.	1	810	----------	18.0° B	1,000
East Side Oil Co., 530 Stimson Block	2	900	----------	----------	--------
		900	740	16.0° B	1,000
Ellsworth & Griggs	9	1=890	750	----------	--------
		6=650	----------	16.0° B	8,000
Embody & Stack, 132 S. Broadway	2	865	----------	16.0° B	6,000
Embody & Stack	1	----------	----------	----------	4,000
Empire Oil Co., 130½ S. Spring Street	4	893	790	14.5° B to 16.5° B	15,000
		740	660		
		860	790		
		840	770		
Eureka Oil Co., 302 Smith & Nolan Block	5	800 to 950	----------	----------	5,000
Ferguson & Canfield, 373 N. Main Street	3	950	800	15.0° B	--------
		950	800	15.0° B	--------
		850	745	14.0° B	2,200
Ferguson, Mrs. M. L., 5 Phillips Block	1	800	----------	----------	1,500
Fowler, R. A., 115 W. Second Street	1	820	760	15.0° B	2,000
Frendberger, P., 321 Metcalf Street	2	620	----------	----------	--------
		620	----------	16.0° B	None.
Green, R., 811 Bonnie Brae	2	915	----------	----------	None.
		907	----------	----------	--------
Greenwood & Barkelow, Toluca and First	2	475	----------	----------	--------
		715	----------	15.0° B	2,000
Guiteau, H. C., 142 W. Twenty-fifth	2	800	----------	16.0° B	3,500
		758	----------	----------	--------
Haight, Webster & Co., 401 N. Figueroa	1	935	780	15.0° B	5,000
Hall, Chas. Victor, 220 Central Avenue	3	900	----------	----------	--------
		900	----------	----------	--------
		750	750	16.0° B	8,700
Harrison, H. H., 316 Park Place	1	860	820	15.0° B	3,000
Henderson, F. B. & Co., 516 Bradbury Blk.	3	700	----------	----------	--------
		960	----------	----------	2,300
		970	----------	----------	--------

STATEMENT OF LOS ANGELES CITY OIL WELLS—Continued.

Name of Company.	Number of Wells.	Depth.	To First Sand.	Specific Gravity.	Product of 1895. Bbls.
Hibbard & Co., 340 S. Edgeware Road	2	760			
		815			7,500
Hoffman & Weller, 109 N. Main Street	3	750	700		
		850	700		
		950	700	14.5° B	4,000
Home, J. K., 1354 Court	1	650		19.5° B	2,000
Johnson, M. D., 216 W. First	4	800			20,000
Keating Oil Co., 945 Pasadena Avenue	2	981	950		
		1,015	975		1,800
Lake Shore Oil Co., 20 Schumacher Block	1	800		17.0° B	1,500
Lathrop, Charles, 1017 Temple Street	2	750			
		850		17.0° B	20,000
Lawrence, George, 20 Potomac Block	3	710			
		745		14.0° B	
		843		14.5° B	3,500
Lehman & Mills, 213 S. Spring	4	950	810	15.5° B	12,000
Lewis, Mrs., 161 Lake Shore Avenue	2	700		16.0° B	5,500
		900			
Libby, C. H., 340 S. Edgeware	2	750			
		800		15.0° B	3,500
Lohma Oil Co., W. Lacy, Pres., 4 Baker Blk.	11				40,000
L. A. Con. Oil Co., Court and Patton	1	720	675	16.0° B	2,000
Luitweiler, S. W., 200 N. Los Angeles St.	2	1,050	1,020	13.0° B	1,500
McCabe, Frank, 302 First Street	4	700 to 1,140	700	18.0° B	
McCray & Warring, Temple and Park Place	3	840			
		850		15.5° B	13,400
McGary & Reed, 227 W. Second Street	2	800	750	16.0° B	500
McGee, E. M., Lake Shore and State	1	830	770		2,100
McIntosh, 207 Bradbury Block	1	811	750		1,500
Maier & Zobelein, 444 Aliso Street	3	800		16.0° B	7,000
Manatt, Rich & Schall, 546 Ruth Avenue	2	765		17.0° B	3,000
		850			
Martin, A. E., 142 Court	4	850		18.5° B	13,400
Mathay, F. L., 1327 Court	3	840			
		800			
		800		16.0° B	12,000
Nelson, R. T., 176 Bonnie Brae	2	860			
		825	740	15.5° B	12,000
Neubauer, J., 1579 Rockwood	1	890	890	15.0° B	8,000
North, Edward, 1127 Temple Street	2	840	780		
		850	770		7,193
O'Reilley, Mrs. Zella, 631 Washington	4	600			
		630			
		757	600	17.5° B	3,000
Orr & Patterson, 147 North Spring	2	600			
		600		16.0° B	1,200
Osborne & Stoll, 9 Metcalf Street	2	800			
		800		16.5° B	8,000
Pacific Union Oil Co., 115 W. Second St.	2	790			
		675			5,000
Parker, L. C., 136 S. Broadway	3	895	1st sand=20.0° B		
		1,005			
		1,024	2d sand=14.5° B		18,700
Parker-Morril Oil Co., W. State and Douglass Streets	11			15.0° B	40,000
Phœnix Oil Co., 41 Bryson	3	870			
		930			
		920		17.0° B	4,500
Powell, James, 1127 Temple Street	2	810		15.0° B	9,500
		745			
Raymond Oil Co., Third and Main Streets	7	825	700	14.5° B	12,000
Rex Oil Co., 230 S. Spring Street	3	820			
		900	765	15.0° B	7,000
Robinson, Geo. S., 233 W. First Street	1	825	515	15.0° B	1,800
Ruddy, Burns & Mathay	2	690			
		715			5,000

Statement of Los Angeles City Oil Wells—Continued.

Name of Company.	Number of Wells.	Depth.	To First Sand.	Specific Gravity.	Product of 1895. Bbls.
Schwartzentahl, Mrs. L., First and Union	3	800		18.0° B	3,000
Sheldon, M. N., Second and Broadway	1	1,026	600	14.0° B	600
Silent, Chas. E., 150 S. Broadway	3	735	680	17.0° B	6,000
Silent & Callender, Second and Broadway	1	1,100	750	15.0° B	2,000
Skinner & Tonkin	3				3,300
Southern Cal. Oil Co., 408 S. Broadway	2	894 888			1,000
Sterling & Co., 340 S. Edgeware	2	660 800			500
Strauss, Mrs. A., 233 N. Grand Avenue	3	750 685 540	450		None.
Sunset Oil Co., 41 Bryson Block	7	850		15.5° B	3,000
Suskin, A. H., 121 S. Broadway	3	850	825	11.0° B	
Thompson, R. C., Omaha Street	1	840		15.5° B	1,650
Tomlinson, Mrs. C., 1318 Omaha Street	1	830		15.5° B	2,000
Tubbs, G. W., Washington Street	2	700 940			1,000
Turner Bros., 206 Patton Street	12				18,000
Union Oil Co., Byrne Block	7				8,152
Walker, Rust & Hunt, 342 Metcalf Street	3	780		16.0° B	10,000
Wilkinson & Kellam, 147 S. Broadway	1	780		16.0° B	1,000
Wing, R. W., 301 Welcome Street	1	840		16.0° B	3,000
Wylie	1	810	770		New.
Total					729,695

Napa County.

Petroleum and gas are found in a soft gray sandstone in the hills W. of Napa and Yountville. In Pickle Cañon, 7 miles W. of Napa, a well 30′ deep shows a scum of petroleum on the water. W. H. B. Smede, of Napa, owner.

Santa Barbara County.

The most important mineral industries in Santa Barbara County are asphaltum and petroleum. In 1895 a remunerative oil-field was developed at Summerland, 5 miles W. of Santa Barbara, and by June, 1896, thirty-eight productive wells had been drilled. As many of them were not completed until the latter part of 1895, the output of oil for that year is smaller than the stated monthly yield indicates. The territory in which productive wells have been obtained at Summerland, extends along the seashore in an easterly direction from Ortega Hill. An examination of the outcropping rocks at Ortega Hill, and a comparison of the depth at which the oil sand has been struck in different wells, demonstrate that the oil-yielding formations dip a little W. of S. at a great angle. These formations constitute a portion of an anticlinal fold, the axis of which extends along the crest of the first tier of hills which rise northward of Summerland. The formation penetrated by the oil wells consists of strata of soft sand or sandstone and blue clay or clay-shale; the oil is contained in the sand or sandstone, and in some wells it has been observed issuing from crevices in the clay or clay-shale. In all the productive wells north of the railroad the oil sand has been struck at a depth of from 30′ to 100′, and south of the railroad the oil sand lies deeper, except at the Williams wells, where oil-soaked sand was found close to the surface.

The oil hitherto placed on the market was black or dark green, and of 10° to 15° B. In a few instances oil of a much less specific gravity has been reported. An inspection of the oil-field shows that there are no productive wells north of a line drawn N. 80° W. and S. 80° E. through the most eastern of the Doulton & Wilson wells. Such a line, in a general way, corresponds to the strike of the oil-yielding formation; if it were extended westward it would pass a little south of the 455′ Williams well on the summit of Ortega Hill. There is a reasonable probability, therefore, of obtaining productive wells between this line and the ocean, and the wells drilled by Mr. Fischer, of Loon Point, show that the oil-yielding formations extend eastward from Summerland for more than a mile. It is also evident that the oil-yielding formations extend southward into the ocean, for not only are productive oil-yielding strata penetrated by the Fischer wells, but at low tide springs of oil and gas are uncovered on the sea-shore. North of the line mentioned there are comparatively shallow wells from which gas is obtained, and is used in Summerland for heating purposes.

The formations underlying the strata pierced by the oil wells appear to be principally dark-colored shales. These are penetrated by a 1,000′ well, drilled by Williams & Easton, about 2,000′ N.E. of the depot, and it is a short distance south of the axis of the fold on which the Summerland oil wells are situated. Mr. Williams states that the formation is grayish or reddish shale and blue clay, and that at a depth of 1,000′ the red shale was saturated with oil.

A 520′ well was drilled by Darling & Turner, on the ridge about $\frac{1}{4}$ mile N. of the depot, and at about 200′ altitude. It is probable that this well is a little north of the axis of the fold on which the oil wells are situated. Mr. Darling states that shale and sandstone were penetrated, and that some of the strata showed traces of oil.

The Occidental and Santa Monica oil wells are in the edge of the Santa Ynez Mountains, which rise to the north of Summerland and the Carpinteria Valley. The formation penetrated by these wells is hard sandstone and dark-colored shale, probably of Eocene age.

Alameda and Santa Barbara Development Co.—It owns five wells at Summerland; three, north of the railroad, are 165′ to 172′ deep, and each yields 5 bbls. in twenty-four hours; two, south of the railroad, are 195′ and 210′ deep, and each yields 8 bbls. in twenty-four hours. W. E. Topham, of Berkeley, Alameda County, secretary.

Backus & Craven's Wells.—These two wells are north of the railroad at Summerland, and are 100′ and 102′ deep. In 1895 they produced 332 bbls. of oil. Oil sand was struck at 70′. Backus & Craven, of Summerland, owners.

Cole's Well.—It is a dug well, 4′ in diameter and 90′ deep. It is north of the railroad, and yields 3 bbls. of oil per twenty-four hours. S. L. Cole, of Summerland, owner.

Dewlaney's Wells.—These three wells are north of the railroad at Summerland, and are 4½″ diameter, and 97′ to 123′ deep. The yield is 5 to 6 bbls. per twenty-four hours. G. Dewlaney, of Summerland, owner.

Doulton & Wilson Wells.—The twelve wells north of the railroad are 4½″ to 5⅝″ in diameter, and 100′ to 150′ deep. When first drilled in 1895 they yielded 10 bbls. each in twenty-four hours, but now yield only

6 bbls. each. The four wells south of the railroad are 168′ to 175′ deep, and each yields 8 bbls. of oil in twenty-four hours.

Fischer's Wells.—These two wells are at Loon Point, about 1 mile E. of Summerland. One of them is a dug well on the seashore, and is 124′ deep. Its oil is dark green and rather heavy. The other well is situated on Loon Point, about 80′ above the ocean. In August, 1895, this well was 185′ deep, and drilling was still in progress. J. K. Fischer, of Santa Barbara, owner.

Forrester & Treadwell Wells.—These ten wells are south of the railroad at Summerland, and are 186′ to 222′ deep. Each yields 5 bbls. oil in twenty-four hours. Forrester & Treadwell, of Summerland, owners.

Loomis' Wells.—These three wells are north of the railroad at Summerland, and are 140′ deep. Each yields 5 bbls. oil in twenty-four hours. C. A. Loomis, of Summerland, owner.

Moore's Wells.—These four wells are south of the railroad at Summerland, and are 206′ to 240′ deep. Each yields 7 bbls. oil in twenty-four hours. W. M. Moore, of Summerland, owner.

Occidental Wells.—These six wells are in Oil Cañon, about 5 miles N.E. of Summerland, and are 200′ to 1,060′ deep. In all of them much water was encountered. In August, 1895, only one was being pumped, and it is said to yield a few barrels of oil a day. Occidental Oil Mining and Petroleum Co., of Santa Barbara, owner; W. S. Day, of Santa Barbara, secretary.

Santa Monica Oil Co.'s Well.—It is about 2 miles N. of Carpinteria, and is 700′ deep. It is said that an amber-colored oil of 18° B. was struck at a depth of 400′, and that the yield was 8 bbls. in twenty-four hours; also, that when the well was deepened to 700′, flowing water was encountered, which "drowned out" the oil. The formation is hard sandstone, which dips S. 10° W., at an angle of 60°. Santa Monica Oil Co., of Santa Barbara, owner.

Stevens & Roberts' Wells.—These three 4½″ wells, north of the railroad at Summerland, are 130′ deep, and yield 7 bbls. oil each in twenty-four hours.

Williams' Wells.—Some years ago (see our VIIth Report, pp. 89 and 90) a 455′ well was sunk on Ortega Hill, and abandoned. On the seashore Mr. Williams has six wells; one 4½′x 5½′ dug well, 50′ deep, yields 10 bbls. oil in twenty-four hours; one 4′x 5′ dug well, 50′ deep, yields 3 bbls. in twenty-four hours; one well, dug 60′, and drilled to a total depth of 77′ and lined with 9⅝″ casing, may be made to yield, the owner says, 100 bbls. oil in twenty-four hours; one 57′ well, 12″ casing, yields 10 bbls. in twenty-four hours, and one 61′ dug well has yielded several barrels of oil by baling. H. L. Williams, of Summerland, owner.

OIL WELLS IN SANTA BARBARA COUNTY.

Name of Producer.	Number of Wells.	Product in 1895—Bbls.
Alameda Development Co.	3	500
Backus & Craven	2	332
Cole, S. L.	1	175
Dewlaney, G.	3	400
Doulton & Wilson	8	3,316
Loomis, C. A.	3	3,000
Occidental	1	500
Stevens & Roberts	3	581
Williams, H. L.	4	8,100
Totals	28	16,904

Santa Clara County.

Main's, H. H., Well.—It is on the south side of Los Gatos Creek, 2 miles N.E. of Los Gatos. It is 10″ in diameter, 800′ deep, and oil was obtained from 300′ downward. Gas was struck at 440′ in depth. A limited quantity of heavy black petroleum was pumped, which is suitable for fuel and lubrication. It is not now utilized.

McPherson (Moody Gulch) Wells.—See our VIIth, VIIIth, and Xth Reports, pp. 93, 547, and 606. They are in a narrow cañon, 2 miles W. of Alma, at 1,100′ to 1,325′ elevation; fourteen wells have been drilled in the district, and oil is now pumped from six, producing 10 bbls. daily. It is principally sold to the gas-works in Oakland. C. C. McIver, of Mission San José, lessee; A. McPherson, of Alma, superintendent.

Santa Cruz County.

In the southeastern part of the county springs of heavy black petroleum issue from shales and sandstones here and there over a considerable area. No wells have been bored to develop the region, however, and no commercial petroleum is produced. See our Xth Report, p. 622.

Chittenden Tar Springs.—They are on the Chittenden ranch, near the railroad station, at about 200′ altitude. A very heavy, dark petroleum flows from the contorted and broken shales at the base of a mountain, and is collected in a few shallow cuts which act as reservoirs. The following analysis is by J. Mosheimer, chemist:

Water	6.00%
Mineral pitch	10.00
Lubricating oil	28.00
Burning oil	36.00
Naphtha	11.00
Gasoline	4.00
Earthy matter	5.00
Total	100.00

Mr. Chittenden, of Chittenden, owner.

Ventura County.

During 1895 the low price of petroleum resulted in very few new wells being drilled, but in this county there is an immense area within which the oil-yielding formations may be followed with a reasonable prospect of success. The principal oil tunnels and wells in Ventura County are situated within a radius of less than 20 miles from Santa Paula. They are: (*a*) In the mountains on the south side of the valley of the Santa Clara River: The Bardsdale, the Torrey Cañon, and the Eureka oil wells. (*b*) In the mountains on the north side of the valley of the Santa Clara River: The wells in Hopper Cañon, the Sespe District, Sulphur Mountain, Sisar Valley (*i. e.*, Silver Thread Oil District), and the O'Hara wells, on the southwest slope of Mount Cayetana. (*c*) There are also a few wells near the localities mentioned, but in 1895–96 they were unproductive. (*d*) On the south slope of Sulphur Mountain there are numerous tunnels which have been run for oil.

The geological structure of this territory presents a series of closely compressed anticlinal folds. These folds are modified by faults, the most important of which have a course nearly coincident with the strike of the formations they traverse. An investigation of the Sespe and Silver Thread districts and Sulphur Mountain shows that the wells are situated on different folds, and that most of the productive wells are near the axis of the folds penetrated. In the localities mentioned, there are two oil-yielding horizons: The uppermost of these, as seen in the Sespe District, consists of dark-colored shales which are interstratified with thin strata of hard limestone resting on drab-colored sandstone. These rocks contain Eocene (*heretofore* classified as Cretaceous B) and Miocene fossils. In the Sespe District they are penetrated by wells at Tar Creek, Four Forks, Brownstone, and the Kentuck claims; in the districts north of Santa Paula, by the O'Hara and the wells at the southern base of Sulphur Mountain. The rocks penetrated by the oil tunnels on the southern slope of Sulphur Mountain also belong to this geological horizon. In the Sespe District this uppermost series of oil-yielding rocks rests on the Sespe brownstone formation. This formation consists of sandstone, shale, and conglomerate, all of which are of a reddish-brown or a black-brown color.

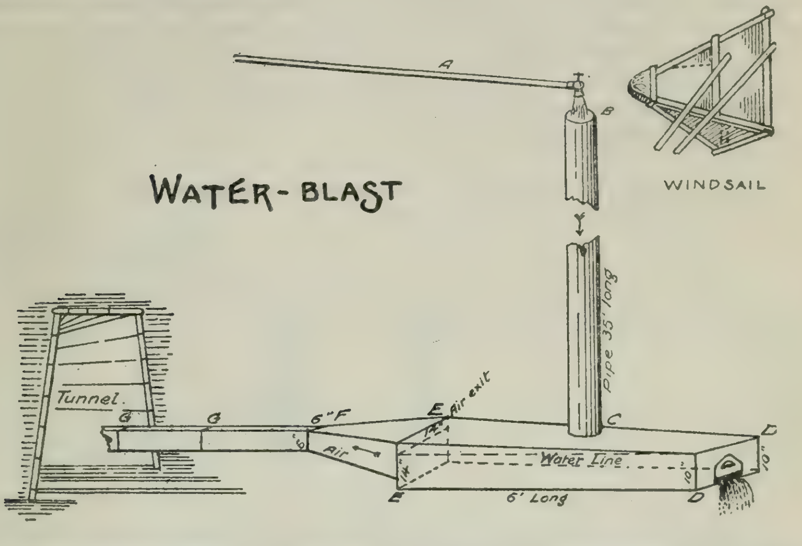
The Sespe brownstone formation rests on a hard, white sandstone composed mainly of white quartz granules. This white sandstone rests on a hard, buff-colored sandstone, which, for the most part, shows a calcareous reaction and contains Eocene (heretofore classified as Cretaceous B) fossils. This formation constitutes a second oil-yielding horizon, as is indicated by numerous oil springs which issue from these Eocene rocks. In the Sespe Oil District rocks of this horizon are penetrated by the oil well of the California Oil Co.

The vertical range of the rocky strata in the territory referred to can be determined by noting the rock exposures in the northern portion of the Sespe District along a line running east from an eminence locally known as Redstone Peak, toward the Piru and Agua Blanca Creeks. A reconnoissance along the line indicated leads to the conclusion that the formations there exposed rest practically conformably on one another, but wherever geological disturbance has been as great as has been the case in the Sespe District, conclusions with regard to the conformity or non-conformity of strata can only be made with safety at points of actual contact.

The Union Oil Co. of Santa Paula handles nearly all the oil produced in Ventura County. It has established a new system of pipe-lines, connecting the oil-field in which its wells are situated with Ventura, where it has a landing for deep-water vessels. A 4″ trunk pipe-line connects Ventura with Sespe. This trunk line is connected with Torrey Cañon and Bardsdale by a 3″ pipe-line, and with the other oil-fields by 2″ pipe-lines. This system comprises, all told, about 100 miles of pipe.

A number of oil tunnels have been run on the southern slope of Sulphur Mountain, about 6 miles N.W. of Santa Paula, and are hereinafter described. The cost of running these tunnels is about $1 50 a foot for the first 100′, and $1 a foot more for every additional 100′, *exclusive* of the cost of timbering. Each foot of tunnel requires one plank, 2″x 12″x 16″, for posts and cap; sometimes lagging is needed. The tunnels are usually 6′ 4″ high, 3′ wide on top, and 4′ on the bottom. A foot-board and a track run the entire length of the tunnel. The track is made either of iron or pine scantling, 3″x 4″x 16″; for sleepers, 2″x 12″ plank is used. At the No. 6 Magie tunnel a combination track and foot-board are used. The foot-board is a plank 2′ wide and the track is formed by nailing, broad-side down along the upper edge of the foot-board, 1″x 3″ pine strips. The oil and water flow down a gutter in the floor of the tunnel to a separating tank, usually of 10 bbls. capacity, where the oil rises to the surface of the water, and is drawn off by a pipe-line, which conducts it to a receiving tank. The water escapes from an outlet at the bottom of the tank.

Some of the strata penetrated by these oil tunnels yield much inflammable gas, and various appliances have been used to force air into said tunnels. The apparatus most successfully employed for this purpose is the hydraulic air-compressor or water-blast.



A sheet-iron column, *C B*, about 35′ long, and supported by a light derrick, enters the top of wooden box *D D E E*, which is 6′ long, 14″ wide, and 14″ high at one end and 10″ high at the other. A 6″x 6″ conduit of dressed lumber, *G G F*, or 6″ casing, is connected by a tapering box, *F E*, with the air end of the box *E E D D*, which is provided with a ½″ slot, *H*, with a sliding gate, which regulates the escape of the water. Water is turned into the top of the column from a ½″ nozzle, *A*, under a 200′ head. Air is carried down with the water and forced through the tapering box and conduit to the face of the tunnel. The Magie No. 6 tunnel in a few hours fills with gas and it takes the water-blast about half an hour to purify the air so that work can safely be commenced. When work is in progress, the tunnels are illuminated by reflected sunlight, or by incandescent electric light. The blasts are usually discharged by electricity, and air-compressors are used to ventilate workings.

Abandoned Wells.—No mention is made herein of wells apparently abandoned.

Adams Cañon Tunnel.—It is at the north end of the West Fork of Adams Cañon, and is 900′ long. It penetrates formations similar to those hereinafter noted at the Pinkerton No. 1 tunnel. It yields sulphuretted water and traces of oil. Union Oil Co., owner.

Adams Cañon Wells.—It is said that twenty-nine wells have been drilled in this cañon; that they vary in depth from 200′ to 2,780′; that they have yielded from 5 to 1,000 bbls. of oil a day; but in June, 1895, only three wells were being pumped, and they are reputed to yield, all told, about 900 bbls. of oil a month. Union Oil Co., of Santa Paula and Los Angeles, owner.

Aliso Cañon.—This cañon is about 10 miles N.W. of Santa Paula, and five wells have been drilled, it is said from 600′ to 700′ in depth. They are small producers and much water accompanies the oil. In May, 1895, they were not pumped. Union Oil Co., lessee.

Bard (*Sisar*) *Wells.*—There are nine wells, 550′ to 800′ deep, about 6½ miles N.W. of Santa Paula and immediately west of the wells belonging to the Capital Crude Oil Co. The drillers state that nearly all these wells showed a disturbed and crushed formation, and that in one of them several feet of asphaltum was penetrated. Some idea of the average life of the wells in the Silver Thread District may be gathered from the following table:

BARD WELLS, SILVER THREAD OIL DISTRICT.

Wells.	Drilled in—	Depth.	Yield when Completed. Bbls. per day.	Yield in June, 1895. Bbls. per day.
No. 2	1892	350′	14	5
No. 3	1892	350′	5	3
No. 4	1894	450′	8	5
No. 5	1893	420′	20	6
No. 6	1893	420′	12	3½
No. 7	1893	350′	8	1½
No. 8	1893	750′	3	1½
No. 9	1893	750′	5	------
No. 10	1894	658′	3	1½

Two varieties of oil are obtained from these wells—one of high specific gravity from the shallowest wells, and one of somewhat lower specific gravity from the deeper wells. Sisar Oil and Asphalt Co., of Hueneme, owner.

Bardsdale Wells.—They are about 3 miles S. of Fillmore, and consist of twenty-two wells. During 1895 they are said to have produced at the rate of 3,000 bbls. of oil a month.

Brownstone (*Old Los Angeles*) *Wells.*—This group is on one of the forks of Little Sespe Creek, about 5 miles N. of Brownstone Spur. There are eight wells, said to be from 400′ to 800′ in depth. Three of them are N.W. of and five of them S.E. of the "forks" of the Little Sespe. The first three penetrate the upper portion of the brownstone formation, and are said to be dry holes. The other five penetrate the lower portion of the dark-colored shale formation, and are said to yield 1,000 bbls. of oil a month.

California Oil Co.'s Well.—It is in Little Sespe District, and 4½ miles N. of Brownstone Spur. The rocks penetrated are of the Eocene ageand belong to the lower oil-yielding horizon in the Sespe Oil District. This well was drilled in 1891, and Superintendent Bradfield states that when a depth of 805′ was reached, the well spouted oil over the top of the derrick. It filled a 250-bbl. tank in less than half an hour. For one month the well spouted oil twice a day, namely, at the hours of 10 A. M. and 8 P. M.; it then ceased to flow. The 160 bbls. of oil were pumped out of it every twenty-four hours for nearly one year. The well then became choked with sand and the yield gradually decreased. In 1894 this well was cleaned out and it yielded 100 bbls. of oil, when it again became choked with sand, and as the price of oil was very low the sand was not removed. In 1896 work was resumed on this well in order to deepen it. A. J. Weil, of No. 201 Broadway, New York, secretary; O. F. Brant, of No. 201 New High Street, Los Angeles, agent.

Capital Crude Oil Co.'s Wells.—Its eleven wells, 400′ to 750′ deep, are situated in the Silver Thread District, about 6 miles N.W. of Santa Paula. One, the Webber well, was abandoned. In 1895 the ten wells were being pumped, and yielded about 900 bbls. of oil a month, consisting of two grades, *i. e.*, oil of high and low specific gravity.

Clark, John, & Co.'s Refinery.—It is at Ventura. The plant consists of two stills and one retort, of a total capacity of 60 bbls. in twenty-four hours. The product is gasoline, naphtha, illuminating and lubricating oils, and asphaltum. This company commenced operations in 1896. G. H. Bartlett, of Ventura, secretary.

Eureka Oil Co.'s Wells.—These are in Limekiln and Smith's cañons, about 1½ miles S. of Piru. They consist of four wells, 400′ to 750′ deep, and are said to yield at the rate of 100 bbls. of oil a month. L. A. Hardison, of Santa Paula, manager.

Farrell & Kimball's (West) Tunnel.—It is on the West Fork of Salt Marsh Cañon. It is 325′ long and penetrates the following formation:

Drift	45′
Dark-colored shale, with fossils	75′
Hard stratum of limestone (oil)	6″
Soft sandstone (with oil), some shale	112′
Shale, with a few thin sandy strata and a little oil	80′
Soft sandstone, with a little oil and much gas	13′

In June, 1895, work was still on progress, and the yield was 60 bbls. of oil a month, and sulphuretted water. Farrell & Kimball, of Santa Paula, lessees.

Farrell & Kimball also own two other tunnels on the West Fork of Salt Marsh Cañon. In August, 1895, each of these tunnels was 140′ in length and yielded about 30 bbls. of a dark green oil per month.

Fortuna Oil Co.'s Wells.—They are in Hopper Cañon, of the Camulos Oil District, about 4 miles N. of Buckhorn. They consist of ten wells, from 90′ to 350′ in depth, and are said to have been very productive from 1890 to 1894. In 1895 they were shut down, owing to the low price of oil. Fortuna Oil Co., of Santa Paula, owner.

Four Forks Wells.—Five wells in Sespe Oil District, about 6 miles N. of Brownstone Spur, were being pumped in 1895, and said to yield, all told, 40 bbls. of oil a day. They vary from 700′ to 1,100′ in depth. It is said that for a long time they yielded at the rate of 750 bbls. of oil a day. Two wells were drilled in 1895–96, and are said to be very remunerative. Union Oil Co., of Santa Paula, owner.

Good's Lower Tunnel.—It is in Salt Marsh Cañon. The formation penetrated is: Drift, 50′; breccia, 20′; drift, 50′, and from that on to the end of the tunnel the formation is sandstone and dark-colored shale.

At the end of the tunnel there is a spring of sulphuretted water and traces of oil. Good Bros., of Santa Paula, lessee.

Good's Middle Tunnel.—It is about 150′ above and 400′ distant from the lower tunnel. It runs 425′ in a N.W. direction. The formation penetrated resembles that in the lower tunnel. Sulphuretted water, but practically no oil, is obtained. Good Bros., of Santa Paula, lessees.

Good's Upper Tunnel.—It is about 80′ above and over 400′ distant from the middle tunnel, and runs 50′ a little W. of N. The formation is principally dark-colored and somewhat slaty shale. A small quantity of oil was struck in a thin stratum of sandstone.

Good & Irwin's Tunnel.—It is situated about 1,000′ a little S. of W. from the Pinkerton No. 1 tunnel. Judging by the dump, the rocks penetrated by this tunnel are very similar to those observed in the Pinkerton lower tunnel. In 1895 it yielded 6 bbls. of heavy oil a month. Good Bros., of Santa Paula, lessees.

Graham Well.—It is a short distance W. of Timber Cañon, on the southern slope of Mount Cayetana, about 10 miles N.E. of Santa Paula. It is said that this well penetrates a soft grayish sandstone to a depth of 275′, and that it can be made to yield 6 bbls. of oil daily by pumping. No product in 1895.

Jones (O'Hara) Wells.—There are five wells about 5 miles N. of Santa Paula, 430′ to 1,170′ deep. Total yield, about 3,000 bbls. of oil a month. Jones Oil Co., of No. 175 N. Spring Street, Los Angeles, lessee.

Kentuck Wells.—Eight wells, varying from 700′ to 730′ in depth, are in Little Sespe District, and about 4 miles N. of Brownstone Spur. They are said to yield at the rate of 4,000 bbls. a month. Dr. J. S. Crawford et al., of Downey Block, Los Angeles, owners; Union Oil Co., lessee.

Magie Tunnel No. 1.—The Magie tunnels are on the West Fork of Salt Marsh Cañon. This tunnel is 200′ long, and penetrated sandstone and slaty shale. When completed, in 1891, it yielded 300 bbls. a month. It now produces about 15 bbls. per month.

Magie Tunnel No. 3.—It is 270′ long, and the formation exposed is similar to that seen in Magie tunnel No. 6, about 150′ northwesterly. It yields 15 bbls. of green oil a month.

Magie Tunnel No. 4.—It is 125′ long, and is situated nearly 400′ N.E. of tunnel No. 1, and at a somewhat higher elevation. The formation penetrated is earth and drift 113′, and sandstone 12′. It was completed in 1894, when it yielded 30 bbls. of oil a month. In 1895 it yielded 8 bbls. of oil a month. About 800′ N. of the last-mentioned tunnel, a decomposed slaty shale is exposed, which exhibits signs of solfataric action. This shale is partly covered with breccia, which rests non-comformably on it and has the appearance of not being in place. About 1,700′ still farther west evidences of solfataric action are very conspicuous, and breccia is exposed, which is cemented with scoriaceous material, and some of the rocks appear to have been softened by heat. Others are decomposed and impregnated with alum and sulphur. North of the solfataric line are bleached slaty shales, interstratified with their irregular strata of impure limestone. A small amount of heavy green oil oozes from these shales, and is then collected in a small reservoir. Below are two tunnels, each of which is about 140′ in length, and yields about 15 bbls. of dark green oil per month. The formation resembles that in the Magie tunnels Nos. 3 and 6. Farrell & Kimball, of Santa Paula, lessors.

Magie Tunnel No. 6.—In June, 1895, it was 560′ long, and work was still being actively prosecuted therein. The formation penetrated shows as follows:

Dark-colored shale, with a few fossils	220′
Hard stratum of limestone and a little heavy oil	2′
Light gray sandstone	120′
Slaty shale	20′
Sandstone, apparently crushed in strata of 1″ to 18″ in thickness, interstratified with layers of clay-shale and clay ⅛″ to ½″ thick. The last 27′ is traversed by cracks running transversely to the strike of the rocks, and the sandstone is saturated with oil	180′
Slaty shale	20′
Hard limestone crushed, yielding oil	3′
Slaty shale, traversed by small fissures yielding sulphuretted water and oil.	

This tunnel yields 200 bbls. of green oil a month. R. H. Magie, of Santa Paula, lessor.

Major Moultre Tunnel.—It is 650′ long, and is situated at the north end of a gulch which extends in a northerly direction from the East Fork of Adams Cañon. It was run to tap a 300′ well which, when first drilled, yielded at the rate of 30 bbls. a day. This tunnel, near its end, penetrated strata which show evidence of solfataric action where they crop out at the surface. The formation is as follows:

Crushed shale	100′
Reddish shale	50′
Slaty shale, with thin strata of hard limestone, yielding 1 bbl. brown oil a day	50′
Hard shale and limestone, yielding sulphuretted water and much gas	200′
Hard shale, with flinty nodules (green oil)	100′
Black slaty shale in thin strata	50′
Shales, with 18″ stratum of slate breaking in thin lamina	100′
Slaty shale, yielding oil and gas.	

It is said that when this tunnel was completed, in 1889, it yielded 900 bbls. of oil a month. In 1895 it flowed at the rate of 50 bbls. a month. Union Oil Co., owner.

Parker & Orne Tunnel.—It is situated in Mud Creek Cañon, and was completed in 1890. It is said to be 100′ long, and to have yielded 60 bbls. of heavy oil a month. This tunnel is now partly caved and no oil flows from it. C. A. West, of Santa Paula, owner.

Pinkerton (Lower) Tunnel No. 1.—It is in one of the North Forks of Salt Marsh Cañon. It is 320′ long, and when completed, in 1894, yielded 45 bbls. of oil a month; in 1895 it yielded 30 bbls. of oil of high specific gravity. The principal source of oil is a sandstone stratum, 8½″ thick, which is traversed by crevices ⅛″ to ¼″ wide. The oil is accompanied by gas and sulphuretted water. Between this sandy stratum and the end of the tunnel, oil and sulphuretted water seep from cracks in the walls and floor of the tunnel. W. Pinkerton, of Nordhoff, lessee.

Pinkerton Tunnel No. 2.—It is about 400′ N. 15° W. from the No. 1 tunnel, and about 100′ higher up the mountain. It is about 700′ long, and was completed in 1892. The formation is shale and soft sandstone; the shale is more slaty than in tunnel No. 1, and some strata contain the bones of fish. There is much gas. Oil, black, was first encountered in small quantities 125′ from the mouth. At 400′ a heavy brown oil was struck at the contact of shale and sandstone. At first this oil seepage yielded 4 bbls. of oil daily. At 630′ a thin stratum of loose sand yielded much gas and sulphuretted water; the strata are nearly vertical. For the next 10′, a light green oil of low specific gravity oozes from thin sandy strata, which are separated by slaty shale. At the end of the tunnel a slaty shale yields much gas and a little green oil. For the first year after its completion this tunnel yielded 150 bbls. of oil a month. In 1895 the yield was 90 bbls. of oil a month.

Pinkerton Tunnel No. 3.—It is also known as the *Jefferson*, and is 400′ long, and was completed in 1893. It appears to be run in consolidated drift, or decomposed rock. A green oil was struck at 100′, and a little oil seeps out here and there throughout the entire length of the tunnel, at the end of which a 35′ hole has been drilled. When completed, it yielded 210 bbls. of oil a month; in 1895 it yielded 50 bbls. of oil a month.

Pinkerton Tunnel No. 4.—It is about 15′ N.W. of No. 3, and about 20′ higher on the mountain. It is 200′ long, and was completed in 1895. The formation is slaty shale. There is a 45′ drill-hole at the end of the tunnel, which yields 30 bbls. of rather heavy green oil a month; no water.

Pinkerton Tunnel No. 5.—Also known as the *Orne* tunnel. It is about 200′ N. 25° E. of No. 4, and 40′ higher. It is 700′ long, and was finished early in 1895. It penetrates soft sandstone and slaty shale. At 100′ a heavy green oil was struck in sandstone. Between 300′ and 400′ from the mouth a green oil of low specific gravity oozes from strata of sandy shale. At the end of the tunnel, the shale is crushed and yields sulphuretted water and brown oil of high specific gravity. At the end of the tunnel a 25′ hole has been drilled and yielded a little oil and sulphuretted water. After its completion, this tunnel yielded 120 bbls. of oil a month for three months. In 1895 the flow was 50 bbls. a month. As before mentioned, the end of this tunnel penetrates crushed rocks, which underlie the solfataric line previously described.

Pinkerton Tunnel No. 6.—It is 400′ N. 25° W. of and about 100′ higher than tunnel No. 5. It is 75′ long, known as the old *Adams* tunnel, and said to have been completed in 1880. The formation appears to be slaty shale, but it is much decomposed; in many places the surface of the walls and the timber are coated with small, flat, lustrous crystals, which appear to be thickest where the gas is the strongest; they were submitted to Prof. C. G. Schneider, the Assistant Mineralogist of the California State Mining Bureau, who pronounced them to be a hydrocarbon mineral. Similar crystals can be found in other old workings on Sulphur Mountain. Before No. 5 tunnel was completed the old No. 6 tunnel yielded 30 bbls. of heavy oil a month. In 1895 it yielded practically nothing.

Pinkerton Tunnel No. 7.—It is 200′ long and has been run a short distance N. of the No. 5 tunnel. The formation is slaty shale. A heavy green oil was struck at the end of this tunnel. When first completed it yielded 120 bbls. of oil a month; in June, 1895, it yielded about 15 bbls.

Salt Marsh Cañon Wells.—These nine wells are about 5 miles N.W. of Santa Paula, and are from 250′ to 1,600′ in depth. It is said that the formation is dark-colored shale and sand. They were drilled in 1887, and said to have yielded 200 bbls. of oil a day for more than a year, but that the yield gradually diminished until 1895, when three wells only were pumped, amounting, all told, to about 300 bbls. of oil a month. Union Oil Co., owner.

Scott & Gillmore Wells.—These seven wells, 300′ to 1,100′ deep, are about 5 miles N.W. of Santa Paula. Total yield, about 100 bbls. of oil a month. The oil varies from a light brown oil to maltha; the light brown oil, *i. e.*, of the lowest specific gravity, is obtained from strata which are the lowest in point of vertical range of any penetrated by this firm. Scott & Gillmore, owners; Union Oil Co., lessee.

Tar Creek.—It is about 8 miles N. of Brownstone Spur, and here thirty-one wells have been sunk from 700′ to 1,100′ in depth. For many years this group of wells has been productive; in 1892 they yielded at the rate of 1,500 bbls. a month; in 1895 only five of them were being pumped, and said to yield about 900 bbls. of oil a month. Union Oil Co., owner.

Torey Cañon Wells.—They are about 3 miles S. of Piru. Nineteen wells were drilled. During 1895 five of them were pumped, and said to have produced at the rate of 4,500 bbls. of oil a month. Union Oil Co., owner.

Union Oil Co.'s Refinery.—It has removed its refinery from Santa Paula to Oleum, on San Pablo Bay, in Contra Costa County, where it has erected a new refinery, which has a capacity of 12,000 bbls. a month. The oil is transported both by land and water from Ventura. The products are gasoline, naphtha, illuminating oil, and asphaltum.

Union Oil Co.'s (No. 6 Lease) Wells.—They are in the Silver Thread Oil District, about 6½ miles N.W. of Santa Paula. They embrace nine wells, from 60′ to 900′ deep. In June, 1895, eight of them were being pumped; said to yield about 600 bbls. of oil a month. Three kinds of oil are obtained: a heavy black, a brown, and a green oil. The black oil is obtained from the shallow wells. Union Oil Co., owner.

Wheeler Cañon Tunnels.—It is said that there are three 600′ tunnels in Wheeler Cañon, yielding 300 bbls. a month. Union Oil Co., owner.

Wheeler Cañon Wells.—They are about 12 miles N.W. of Santa Paula. It is said that five wells, 200′ to 900′ deep, were drilled in this cañon; and that the chief oil-bearing stratum was struck at 90′ in depth. Also, that the best well was only 250′ deep and that it yielded 30 bbls. of oil a day for six months, and then went dry. Union Oil Co., owner.

QUICKSILVER.

Colusa County.

Buckeye Mine.—See Wide Awake Consolidated.

Central Mine.—See our XIth and XIIth Reports, pp. 185 and 359. It is immediately east of the Manzanita Mine, in Sulphur Creek District, at about 2,100′ elevation. Cinnabar occurs in seams in altered serpentine, and shows a good prospect where the rock is partly disintegrated near the surface. It is concentrated in sluice-boxes and the concentrates retorted. Idle. G. W. Northey and W. E. York, of Sulphur Creek, owners.

Elgin Mine.—See our XIIth Report, p. 359. It is 3 miles N. of Sulphur Creek. Idle, but the lessees, Oeldart & Smith, of Sulphur Creek, expect to resume work soon. J. H. Moore, of San José, owner.

Empire Mine.—See our XIth Report, p. 186. It is in Sec. 28, T. 14 N., R. 5 W., on the south side of Sulphur Creek. The workings consist of a 168′ tunnel, in which a small amount of cinnabar can be seen. Four men are employed developing. W. E. York and T. Pearson, of Sulphur Creek, owners.

Farris (*Oriental*) *Mine.*—See our XIIth Report, p. 359. It is in Sulphur Creek District. Idle. J. H. Moore, of San José, owner.

Manzanita Mine.—See Manzanita, under Gold. It is in Sulphur Creek District, and was formerly worked for both gold and quicksilver, but recently it is worked for gold only.

Rathburn Mine.—See our XIth and XIIth Reports, pp. 181 and 359. It is on "Dead Shot" Ridge, on the west side of Bear Valley. The workings consist of a 4′x 8′ shaft, 130′ deep, with 145′ of drifts. Idle. J. P. Rathburn, of Williams, owner.

Sulphur Creek Mining District.—See our XIth Report, pp. 181 to 187. It is near the western boundary of the county, about 20 miles S.W. of Williams, the nearest railroad station. Numerous quicksilver mines have been developed, and a part of them have produced considerable metal. They are mostly idle, but more or less preparation is being made to resume work. Gold is also produced; sulphur mines formerly existed, but are practically abandoned. Numerous mineral springs are among the things of economic interest.

Wide Awake Consolidated (*Buckeye*) *Mine.*—See our XIth Report, p. 187. It is immediately S.W. of the village of Sulphur Creek, and consists of 64 acres of mining claims, including the *Buckeye*, and 2,000 acres of agricultural and timber lands. A large quantity of good ore is said to have been taken from this mine years ago through a double-compartment shaft about 200′ deep. The workings are inaccessible. Two men are employed repairing the shaft, with a view of resuming work. A. A. Gibson, of Sulphur Creek, owner.

Lake County.

Abbott Mine.—See our XIth and XIIth Reports, pp. 239 and 360. It is near the head of Grizzly Creek, ½ mile from the eastern boundary of the county and 28 miles S.W. of Williams, at about 2,500′ elevation. Cinnabar occurs in seams in the shale near the contact with serpentine, in a belt which courses N. of W. The main tunnel, ¼ mile S. of the furnace, is 500′ long and courses N., cross-cutting the shales to the ore-belt. It then turns E. and extends 700′ along the ore-belt, as a gangway. The ore-shoot, which is 2′ to 18′ thick, is followed 600′ upward, on a slope of 30° to 40°, to the upper tunnel. As the work progresses the ground is secured by filling the stopes with waste, by which the expense of timbering is reduced. The mine is comparatively dry, well ventilated, and, where necessary, well timbered. A large quantity of ore is in sight, and the output of the mine is said to have averaged 151 flasks per month for the last twelve months. The plant consists of a Knox & Osborne 10-ton coarse-ore furnace; 6 small iron water-jacketed condensers; a blower, run by a 20′ overshot wheel, requiring 1½ inches of water, which comes from the mine; commodious ore-sheds; etc. The fine ore is made into "adobies," and treated as coarse ore. Fourteen men are employed in the mine and works. J. Rathbone, of San Francisco, owner; A. A. Gibson, of Sulphur Creek, superintendent.

American Mine.—See our XIIth Report, p. 360. It lies 7 miles W. of Middletown and N. of the Great Western Mine, on the cinnabar belt, at 2,500′ elevation. The furnace was destroyed by fire, and the mine is idle. Wright Bros., of Middletown, owners.

Baker Mine.—See our XIIth Report, p. 360. It lies 5 miles E. of Lower Lake. Idle several years. J. C. Baker, of Lower Lake, owner.

Bullion Mine.—See our XIIth Report, p. 360. It is 4 miles S.W. of Middletown, on the cinnabar belt, between the Mirabel and Great Western mines. In 1895 it was being prospected on the surface. Wm. Parsons et al., of Middletown, owners.

Chicago Mine.—It lies on the cinnabar belt, 6 miles W. of Middletown, at 2,500′ elevation. It comprises four 1,200′ by 3,000′ claims. There are two tunnels on the vein, 100′ and 400′ long, respectively, and a shaft 20′ deep. The vein matter is hard, opaline serpentine, 22′ thick, showing specks of cinnabar throughout. The walls are green and black serpentine. In November, 1895, there were 5,000 tons of sorted ore on the dump awaiting treatment. Munz & Ransdell, of Middletown, owners.

Destinell Mine.—It is an east extension of the Abbott Mine, and comprises three claims, extending into Colusa County. Idle. J. Rathbone, of San Francisco, owner.

Great Western Mine.—See our XIIth Report, p. 361. This property lies 4 miles S.W. of Middletown, at 1,860′ altitude. It embraces a 6,000′ strip along the cinnabar belt, which runs through Napa, Lake, and Sonoma counties, in a northwesterly course. The hanging-wall is black alta of unknown thickness, and the foot-wall greenish-gray, highly metamorphosed sandstone, with thin seams of calc-spar and antigorite. The vein matter is made of an innumerable number of thin layers of black, greenish, or yellowish translucent opaline rock, the layers of which are separated by still thinner seams of clay and sometimes calc-spar. The thickness of the ore-bearing zone varies from 10′ to 150′ and more. The cinnabar is found associated with pyrite in irregular masses throughout the vein. The mine is worked to the 500′ level through a double-compartment main shaft, which had, in December, 1895, been sunk to the 700′ level. Connections with the ore-body were not, however, completed, and the ore from below the 500′ level was raised through a winze by two underground hoists, driven by compressed air, and thence up the main shaft. New levels from the shaft on the 600′ and 700′ levels are now about 600′ long, and are being pushed ahead rapidly to connect with the stopes. Two Burleigh drills, driven by air, are in use, one in each level. A tunnel nearly a mile long connects the works on the 500′ level, and is used for drainage and ventilation; the water from below is raised to it in buckets. They are stoping on an ore-body between the 250′ and 500′ levels, which was considered too poor, but found to be rich when penetrated. It is about 40′ thick, 80′ long, and 150′ high. Between the 600′ and 700′ levels large bodies of rich ore are blocked out, and stoping has begun. The timbering is a matter of great expense and care. The ground is very heavy, and square sets of 12″ to 36″ round timber are used. They cost 8 cents per running foot. Lagging, made of split fir, costs $60 per 1,000 pieces. The mine is very hot, and in some of the stopes it is unbearably so. The cars used are the ordinary end-dumper, and hold about 1,500 lbs. The hoists at the main shaft have two drums, 4½′ diameter, with two independent engines, 10″x 12″ cylinders. The rope is ⅞″ diameter. There are two air-compressors, a small one of 15 H.P. at the main shaft, and a large one of 25 H.P. at the mouth of the long drain tunnel. There are two furnaces and condensers; one for coarse and one for fine ore, with capacities of 25 and 15 tons each. The product for 1895 was 5,400 flasks. Employed in and about the mine are 150 men. Great Western Quicksilver Mining Co., owner; Andrew Rocca, of Calistoga, superintendent.

Maypole Mine.—It lies on the cinnabar belt, at 2,500′ altitude, 7 miles W. of Middletown, and is 600′ wide by 1,500′ long. The vein is 8′ thick as far as prospected, and carries cinnabar in silicified serpentine. There is a 180′ tunnel on the vein, and two cross-cuts, each 50′ long. Farmer & Turner, of Middletown, owners.

Mirabel (*Standard*) *Mine.*—See our XIth and XIIth Reports, pp. 64 and 361. It lies 4 miles S.W. of Middletown, on the cinnabar belt, at 1,600′ elevation, and comprises 1,200 acres. Both walls are light green serpentine. The vein matter is a hard, dark green or black opaline serpentine, carrying cinnabar in seams and incrustations. The 5′x 10′ main shaft, through which all the ore is hoisted, is 425′ deep. It has two compartments, one of which is used for the cage and the other for an 80-gal. water-tank with an automatic discharge. Levels are driven at 200′, 250′, 300′, and 400′ deep. An old shaft, 150′ farther west, is used for hoisting waste. A new three-compartment shaft, called the Santa Maria, and about 500′ S.W. from the main shaft, has been started. It is 4½′x 12″ in the clear and was 65′ deep, in December, 1895, and timbered with 12″x 12″ sawed timber. Work was suspended for the present. Below the 400′ level an incline 105′ deep has been sunk, and at its bottom a drift has been run to meet the Santa Maria shaft when completed. A small hoist and pump, driven by compressed air, stand at the head of the incline on the 400′ level. Stoping is going on between the 300′ and 400′ levels and below. The ore-bodies are 20′ to 60′ wide, and great care is taken to timber the large chambers securely. Square

Great Western Quicksilver Mine.

Furnace of the Mirabel Quicksilver Mine.

sets of round timber, 18″ to 36″ in diameter, are used. In stoping, tight 2″ flooring is laid and the ore sorted where it is broken. Iron cars of about 1,500 lbs. capacity are used. The double-engine hoist has 8″x 14″ cylinders, and 3′ drums. The rope is ⅞″ steel wire. The ore dumped from the cars runs over a grizzly, made of old mine rails, and over a screen with 1″ mesh. The coarse material is ground to the required size in a rotary crusher. There are two large new furnaces of the latest pattern for coarse and fine ore. Only fine ore is treated. Oak wood costs $3 50 per cord; fir timber, 8 cents per lineal foot, and lagging, $60per 1,000 pieces. The product for 1895 was 4,000 flasks. Standard Quicksilver Mining Co., owner; W. M. Randol, No. 320 Sansome Street, San Francisco, superintendent.

Sulphur Banks Mine.—See our XIIth Report, p. 361. This lies on Clear Lake, 10 miles N. of Lower Lake, at 1,340′ altitude. The ore is found in a hard, white rock. The shaft has two compartments—one for water and the other for the cage. A double-hoisting engine and a blower stand above the shaft. The mine is very hot, and air is carried down in wooden pipes, as iron corrodes very fast in the hot, sulphurous water in the workings. Sulphur Banks Quicksilver Mining Co., No. 306 California Street, San Francisco, owner; R. White, of Lower Lake, superintendent.

Uncle Sam Mine.—See our XIIth Report, p. 362. It is 10 miles N.W. of Lower Lake. Idle. A. A. Gibson, of Lower Lake, owner.

Utopia Mine.—It lies on the bank of Clear Lake, 8 miles E. of Lakeport, at 1,450′ altitude. There are two cross-cut tunnels; one is 120′ long, with a 30′ drift on the vein, and the other is 150′ long, with a 50′ drift. At the end of the drift a 60′ inclined winze shows good ore all the way down. The vein matter is about 25′ thick, and consists of a greenish-gray sandstone, with seams of serpentine. On the hanging-wall lies "alta" many feet in thickness. The foot-wall is serpentine. The strike is S.E. and the dip 60° E. A small amount of water seeps in from the lake near the surface. Below 40′ the mine is dry. Utopia Mining Co., owner; Thomas Sheridan, of Lakeport, secretary.

Wall Street (Jewess) Mine.—See our XIIth Report, p. 362. It is 6 miles W. of Middletown. Idle.

Napa County.

Ætna Mine.—Described fully in our XIth and XIIth Reports, pp. 72 and 362. It is at the head of Pope Valley, 11 miles S. of Middletown, Lake County, at 1,340′ altitude. The main tunnel (No. 9 level) is now 4,000′ in, and an upraise of 280′ was nearly completed to No. 7 level in 1895. They are stoping both in the seventh and ninth levels. The ore-shoot is very irregular, and averages 200′ in length and 20′ in width. The two furnaces—a 15-ton one for coarse ore and a 20-ton one for fine ore—are constantly running. The product for 1895 was about 3,600 flasks. Ætna Consolidated Quicksilver Mining Co., owner; W. B. Buckminster, No. 70 Kilby Street, Boston, secretary; B. M. Newcomb, of Oat Hill, superintendent.

At Calistoga quicksilver is found in the soil in and about town. See Calistoga Mineral Springs.

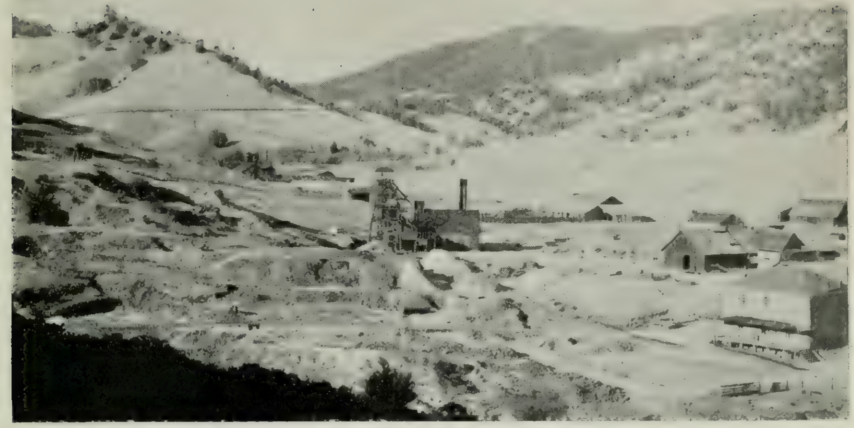
Corona Mine.—It lies at the head of Pope Valley, 8 miles S. of Middletown, at 1,460′ altitude, and is a recent location on the serpentine belt near Oat Hill. There are three cross-cut tunnels tapping the vein;

the upper one is 90′ long; the next, 60′ lower, is 287′ long, and the last one, 194′ still lower, is 400′ long. All of them show a very hard, silicious rock, rich in cinnabar. The vein formation is 90′ between walls, and consists of alternate thin strata of sandstone and "alta." The course is E. and W., and the dip 55° S. The country rock south of the vein is serpentine, and north is a soft gray sandstone. The company is building a 20-ton fine-ore furnace, to cost about $10,000. Some 600 tons of rich ore lie on the dumps. Vallejo Quicksilver Mining Co., owner; H. C. Davey, of Calistoga, superintendent.

Harrison Mine.—See our XIIth Report, p. 363. It is 16 miles S.E. of Lower Lake, near the Manhattan. The mine has been idle about a year, but it is said it will be opened up shortly. M. Harrison, of Knoxville, owner.

Manhattan (*Lake*) *Mine.*—See our XIth and XIIth Reports, pp. 70–72 and 363. It lies 17 miles S.E. of Lower Lake, at 1,450′ altitude. The older workings in this mine, including those described in our last Report, were closed, when a new discovery was made in the spring of 1895 on the hill north of the store. Cinnabar here occurs in seams, 6″ to 6′ wide, coursing in every direction. The gangue in places is made up of alternate layers of silicious and carbonaceous sinter—chalcedony and aragonite. In other places it consists of a mass of crushed and much decomposed diorite. The latter is colored intensely green by an admixture of chrome. Basaltic bowlders cover the surface of the hill. The ore is mined in trenches and open cuts along the veins on the surface. A tunnel has been started to cut these veins 150′ below the surface. A small body of ore, lately discovered, is now being stoped 100′ from the mouth of the old Harkins tunnel, on the east side of the property. It is about 4′ wide, and consists of a crumbly material rich in cinnabar. The country rock is diorite and basalt. The serpentine belt, which carries cinnabar, and passes through the Redington Mine, just over the hill, runs to the south of the workings in the Manhattan ground, and is barren as far as prospected. During 1895 the two 20-ton furnaces produced 85 flasks per month. Manhattan Quicksilver Mining Co., owner; R. F. Knox, No. 237 First Street, San Francisco, secretary; Charles Howard, of Knoxville, superintendent.

Napa Consolidated Quicksilver Mining Co.'s (*Oat Hill*) *Mine.*—See our XIth and XIIth Reports, pp. 65–72 and 364. It lies on James Creek, at the head of Pope Valley, 9 miles S. of Middletown, Lake County, at 1,810′ altitude. The country rock is a soft gray sandstone, interstratified with innumerable seams of soft "alta." In the three lowest cross-cut tunnels on the western end of the mine the three following veins, or zones, impregnated with cinnabar, are developed: The *Humboldt*, running west; the *Osceola*, a branch of the Humboldt, running southwest, and the *Escape*, running west. All the ore extracted at present (1895) comes from the stopes of the Humboldt and Osceola, the faces of whose tunnels are about 500′ from the mouths. An old tunnel (No. 2 Eureka), 1,200′ long, is being cleaned out and retimbered to reach a large ore-body known to exist in the Escape vein. Generally the ore occurs in the sandstone, but sometimes it is found in the "alta" also. The ore-bodies are very irregular, and a great deal of dead work is necessary. There is nothing to indicate their presence until they are struck. The ground is heavy, on account of the many "alta" seams and talc slips. Square sets of sawed timber are used throughout the mine, and slabs for lagging.



Redington Quicksilver Mine.

Manhattan Quicksilver Mine.

Six men attend to the timbering. The ore is dumped into a bin at the mouth of the tunnels, and from there hauled by mules in 2-ton cars to the furnaces, half a mile away. The fine-ore furnace has a capacity of 50 tons per day. Another fine-ore furnace of the same size is under construction. Wood for firing is cut in the vicinity, at $3 75 per cord. Timber costs about 5 cents per lineal foot; lumber $12 per M. Driving the gangways is generally let to the miner, at from $2 to $2 50 per foot. The product for 1895 was 5,700 flasks. Napa Consolidated Quicksilver Mining Co., owner; W. B. Buckminster, No. 70 Kilby Street, Boston, secretary; B. M. Newcomb, of Oat Hill, superintendent.

Oakville Mine.—See our XIIth Report, p. 364. It lies 1½ miles S. of Rutherford. Idle. Bella Union Mining Co., owner.

Redington (*Knoxville*) *Mine.*—See our XIth and XIIth Reports, pp. 69–72 and 363. It is situated 18 miles N.E. of Lower Lake, at 925′ altitude. The mine has been idle since June, 1894, but late in 1895 it was started up again. The 4½′x 10′ double-compartment shaft (now 300′ deep) will be sunk 100′ deeper. They were stoping on a fine body of ore on the 200′ level in 1895. The hanging-wall shows "alta" and talc, while the foot-wall is decomposed serpentine. The country rock is serpentine. The ore is black chalcedony with pyrite, and the distance between walls is 15′. Hoisting is done by bucket. The hoist is operated by a single engine, with a 7″x 14″ cylinder. A flat, woven-wire cable, 4″ wide, is used, and winds upon itself. The ore is very hard, and is crushed in Blake crushers, ready for the 30-ton fine-ore furnace. A. McMillan, of Knoxville, owner.

Summit Mine.—See our XIIth Report, p. 365. It lies 3 miles S.W. of Rutherford. Idle. Bella Union Mining Co., owner.

Vallejo.—In the hills N.E. of Vallejo cinnabar is found in many places. Years ago several mines were working in that vicinity, but nothing is done there now.

San Benito County.

Gypsy (*San Benito*) *Mine.*—See our Xth, XIth, and XIIth Reports, pp. 515, 371, and 365. It is in the McLeod District, 16 miles N.E. of Hollister, at about 2,700′ altitude. The "Harris" tunnel has been extended to 900′ total length. There is a 10-ton furnace on the property. Idle since February, 1895. San Benito Mining Co., of Chicago, owner; Frank Wixam, of Chicago, superintendent.

New Idria Mine.—See our VIIIth and XIth Reports, pp. 483 and 373. It is at the head of San Carlos Creek, in a mountainous region, 58 miles S.E. of Tres Pinos. It is developed to a depth of 1,200′ by tunnels, collectively 3,000′ in extent. There is a vast quantity of ore (tierras) on the dump and in the old workings, said to run 1% to 15% cinnabar. Also a considerable quantity of unbroken ore in the stopes, rich enough to pay. There is a 10-ton coarse-ore furnace, with a capacity of 110 flasks per month. A new 30-ton furnace will be completed by September, 1896. Little fine ore (tierras) has been reduced, but the company expect to work the vast quantity now on the dump and in the stopes. The country rocks, in the immediate vicinity of the vein, are shales and sandstones, somewhat metamorphosed, and dipping at steep angles. The hanging-wall, which is better defined than the foot-wall, consists principally of finely laminated clay shales, in which slickensides occur. The foot-wall is poorly defined, and consists of arenaceous shale to soft sandstone. Fifty men are employed; 21 in mining, 4 at the furnaces, and 25 roustabouts. New Idria Quicksilver Mining Co., owner; B. M. Newcomb, of Oat Hill, superintendent.

San Luis Obispo County.

A number of claims were taken up years ago in the Santa Lucia Mountains, in the northwestern part of the county, some development work done, and quicksilver produced, but they are generally idle. See our Xth and XIIth Reports, pp. 580 and 366.

Black Hawk Quicksilver Mine.—See our XIIth Report, p. 366. It is in Carpojoro Cañon, 3 miles from the ocean, and 12 miles N.W. of San Simeon. One man is driving a prospect tunnel, said to be 150′ long. No furnace or retort at the mine. John Secombe, of San Simeon, owner.

Josephine Mine.—See our Xth Report, p. 580. Idle.

Keystone Mine.—See our Xth Report, p. 581. Idle.

Oceanic Mine.—See our Xth and XIIth Reports, pp. 580 and 366. Idle.

Ocean View Mine.—See our Xth Report, p. 581. Idle.

Pine Peak Mine.—See our Xth and XIIth Reports, pp. 581 and 366. Idle.

Rinconada Mine.—See our Xth and XIIth Reports, pp. 581 and 366. Idle.

Santa Cruz (Sunderland) Mine.—See our Xth and XIIth Reports, pp. 580 and 366. Idle. It is 1 mile W. of Adelaide. Worked intermittently. Produced 20 flasks in 1895. Edwin Smith, of Paso Robles, owner.

Santa Clara County.

Bradford & Treadwell Mine.—See our XIIth Report, p. 367. It is on Silver Creek, 11 miles E. of San José, at about 900′ elevation. Idle. C. P. Bradford and J. Treadwell, of Evergreen, owners.

Guadaloupe Mine.—See our VIIIth Report, p. 542. It is on Guadaloupe Creek, 6 miles E. of Los Gatos, at 425′ elevation. It is said to have formerly produced 1,200 to 1,500 flasks per month. Idle. J. V. Coleman, of San Francisco, manager.

Hillsdale Mine.—It is ½ mile W. of Hillsdale. Quicksilver was produced here some years ago. Idle. G. Promis, of San José, owner.

New Almaden Mines.—See our VIIIth, Xth, and XIIth Reports, pp. 541, 604, and 370. They are 15 miles S. of San José, at 1,700′ elevation. The reduction works are at Hacienda, 425′ elevation. These famous mines have produced, since 1850, more than 950,000 flasks, or 72,675,000 lbs. During the last eight months of 1895 the output averaged 555 flasks per month. The quantity produced has only been exceeded by those of the Almaden, in Spain. The occurrence of the ore in these mines is characterized by great irregularity in quantity and richness, which has caused a correspondingly great variation in the output, which ranges from 4,000 to more than 47,000 flasks per annum. It occurs in shoots and bunches in a brecciated zone, along the contact of serpentine (foot-wall) and shales (hanging-wall), in which the vein matter is principally serpentine. In portions of the vein, it is full of rich cinnabar, while in other portions it is very lean, the cinnabar being only in seams. It is generally richer near the hanging-wall, and becomes poorer with depth as the vein matter becomes harder. The company own 8,500 acres of land on which are the mines, reduction works, and villages of Hacienda, New Almaden, and Spanishtown. The mines are developed to a depth of 2,500′ below the summit, and the underground workings are said to be more than 70 miles in extent; a large part of which is now more or less inaccessible. There are six shafts now equipped with hoisting works, and more than that number from which the machinery has been removed. Those provided with hoisting works are the *Buena Vista*, *Harry*, *Randol*, *R. R. B.*, *Santa Isabel*, and *Victoria*. There are also numerous tunnels of great extent. Ore is now raised only from the Harry and Randol shafts. Since our last Report the Harry shaft has been sunk from the 700′ to the 800′ level, and about 350′ of drifts run on the 800′ level. The vein matter is harder than in the upper levels, and contains less metal. Burleigh drills are used in drifting. About 600′ of drifts have been run on the 700′ level and a small quantity of ore obtained. On the 600′ level an ore-shoot, 45′ wide and 16′ thick, has been followed about 650′. The ore varies in quality, but shows fair ore in the face of the stope. Overlying this shoot, and separated from it by a thin sheet of "alta," is a body of ore of unknown extent, which was recently discovered. The ore is hoisted through the Harry shaft to the 500′ level, thence drawn through the Harry tunnel to the surface. Ore is also mined from a shoot in the 1,300′ level of the Randol shaft, which is of comparatively low-grade. The company is sinking the R. R. B. shaft on the eastern side of Guadaloupe Cañon, near the old Enriquete Mine, about 1½ miles N.W. of New Almaden and at about 1,000′ elevation. It is a 4½′x 7½′ double-compartment shaft, and when a depth of 500′ is reached a cross-cut will be run to the old Eldridge tunnel, from which much rich ore is said to have been mined. If the quantity of ore is found to be sufficiently great, reduction works will be put up on Guadaloupe Creek. The timbers used in the New Almaden mines are 10″x 10″ to 20″x 20″ redwood, which is obtained at Boulder Creek. Coal is used for fuel in the hoisting works, and wood in the reduction works. The latter are on Alamitos Creek, at Hacienda, and consist of eight furnaces, five of which are now operating. They are constructed to treat one of the three sizes into which the ore is reduced: tierras, granza, and granzita. It is conveyed from the mine to the works in cars, which make the descent by gravity inclines, 250′ and 450′ long, with a piece of level track between. The Quicksilver Mining Co., of New York, owner; R. R. Bulmore, of Hacienda, agent; Charles Derby, of Hacienda, superintendent.

North Almaden.—See our XIIth Report, p. 367. It is 9 miles S.E. of San José. Idle. Edward Piercy, of San José, owner.

Quicksilver Production.—See table in XIIth Report, pp. 68 and 69. Also our Bulletins Nos. 7 and 8.

Summit Mine.—Described under Stanislaus County.

Wright Mine.—See our XIIth Report, p. 370. It is on a tributary of Los Alamitos Creek, 20 miles S. of San José, at about 800′ elevation. Quicksilver was mined here years ago. Idle. Mrs. A. E. Wright, owner.

Siskiyou County.

Barton & Lange's Mine.—It lies on Klamath River, 4 miles below Oak Bar, at 1,855′ elevation. The cinnabar is found in a bed of gray-green sandstone, lying between black slate, which dips 45° S. The ore is bought by Chinese for medicinal purposes principally. The translucent red crystals bring $2, and the gray $10 to $12 per pound. The cinnabar sold is obtained by washing the debris in sluices with pole riffles. Two tunnels, 65′ and 80′ long, are driven on the vein. J. H. Barton et al., of Oak Bar, owners.

On Horse Creek, 10 miles N.W. of Oak Bar, some cinnabar is found in the sluice-boxes of the placer mines.

Siskiyou Quicksilver Mining Co.'s Mine.—See our XIIth Report, p. 370. After lying idle for several years, a prospect tunnel is being driven into the deposit. J. C. McCauly, of Oak Bar, superintendent.

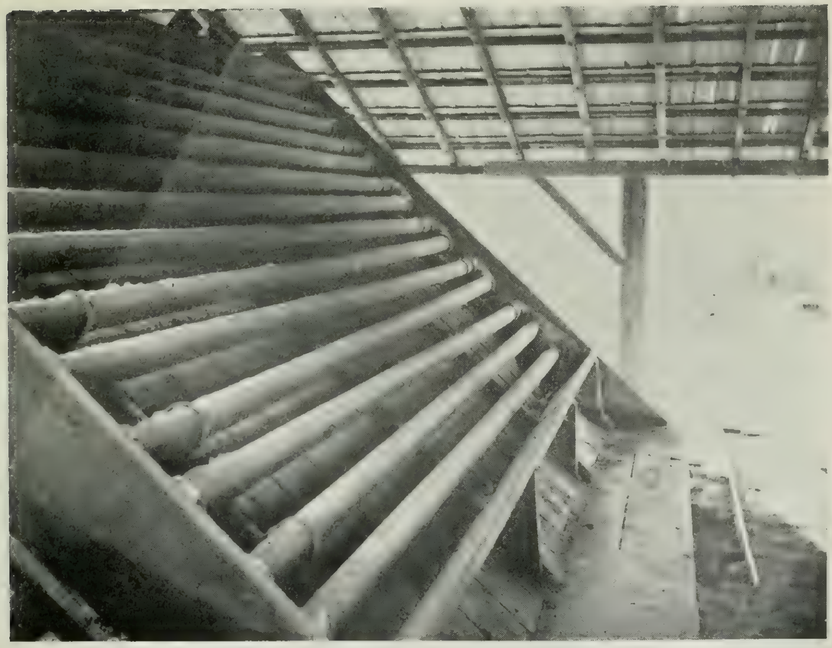
Sonoma County.

Black Bear Mines.—See our XIIth Report, p. 371. These lie on Little Sulphur Creek, 2 miles S. of the Geysers, at an altitude of 2,500′, and comprise the following locations: *Black Bear*, *Commonwealth*, *Geyser No. 1 and No. 2*, *Hecla*, *Oakland*, and others, along a wide belt of serpentine, which courses N.W. and S.E. and carries cinnabar and metallic quicksilver. Considerable ore has been taken out of these mines years ago. The tunnels are all caved and the reduction works and buildings burned. Black Bear Consolidated Mining Co., owner; L. W. Fee, of Calistoga, superintendent.

Cinnabar King Mine.—See our XIIth Report, p. 371. This property lies on Pine Mountain, 12 miles E. of the Geysers, at 2,840′ elevation. It embraces the following six claims: *Ellen*, *Flying Dutchman*, *Goodenough*, *Head Center*, *Last Chance*, and *Paymaster*. A new tunnel, 150′ below the old one, is run 400′ to an ore-body lately (1895) discovered, and the old one is being extended 150′ to 200′ to strike the same ore. A winze, just finished, connects them for air. The property lies on the Great Western cinnabar belt. The hanging-wall is soft gray sandstone and the foot-wall is green and gray serpentine. The vein matter is sandstone, with thin seams of "alta" and yellow clay. The dip is 45° to 80° S.W. There are about 2,000 tons of selected ore on the dump, besides a large quantity of base ore. It is intended to build a furnace early in 1896. Cinnabar King Quicksilver Mining Co., owner; Edward White, of Healdsburg, superintendent.

Great Eastern Mine.—See our VIIIth and XIIth Reports, pp. 633 and 371. It lies 4 miles N. of Guerneville, at 400′ altitude. The property consists of the *Great Eastern* and *Mount Jackson* claims. The mines are located on a belt of serpentine, coursing E. and W., which can be traced nearly to the coast. The hanging-wall is serpentine, the foot-wall sandstone. The vein matter is a hard, silicified serpentine, 20′ to 80′ thick, separated from the serpentine of the wall by 6′ to 8′ of "alta." The dip is 60° to 90° N. Generally the wall stands well; single stulls, 12′ to 25′ long, are sufficient. Where square sets are required, 6″x 6″ and 8″x 8″ sawed timber are used. Work is carried on through the Great Eastern shaft, 360′ deep, from which levels are run at 140′, 220′, and 360′ depth,

Great Eastern Mine.



Ore-Drier of Great Eastern Mine.

into the Mount Jackson property. They are now stoping between the 220′ and 360′ levels. The hoisting plant consists of an 18″ drum, driven by a double engine with 8″x 14″ cylinders. The steel rope is 1″ in diameter. A 25 H.P. Phœnix air-compressor furnishes power for three Phœnix drills. The coarse ore is piled in sheds to dry and the fine is spread on an inclined drier, composed of planks, over which, and about 2″ above, is placed, in a serpentine manner, 4″ pipe heated by exhaust steam. When the ore is sufficiently dry, the movable foot-board is taken out and the ore falls upon the floor. There is a fine and a coarse ore furnace, each of 15 tons capacity. About 2,000 cords of wood is used annually, at a cost of $2 25 per cord. Round timber for the mine costs 5 cents per lineal foot. Great Eastern Quicksilver Mining Co., owner; Alfred Abby, 44 Nevada Block, San Francisco, secretary and superintendent.

Missouri Mine.—It is 3 miles S. of the Geysers, at 2,760′ elevation, and adjoins the Black Bear property on the east. Only assessment work is done. L. W. Pittman, of Geysers, owner.

Rattlesnake Mine.—It lies 4 miles S. of the Geysers, and E. of the Missouri, at 2,420′ elevation. Ore from this mine contains a large percentage of native quicksilver, which leaks out of the ore. Idle. Parrott Estate, owner.

Red Cloud Mine.—It lies 5 miles S.E. of the Geysers, and W. of the Rattlesnake. Several short tunnels were made on this claim, and cinnabar was found in all of them. Idle. R. Swift, of Healdsburg, owner.

Sonoma Mine.—This is 5 miles S.E. of the Geysers, and adjoins the Red Cloud. The mine has furnished a great quantity of quicksilver in former years. The extensive workings are caved and the mine idle. Mrs. General Dodge, of San Francisco, owner.

Stanislaus County.

Summit Mine.—It is on the divide at the south end of Red Mountain and western boundary of the county, at 2,750′ elevation. Cinnabar is in seams in very much crushed serpentine, sandstone, and shales. The developments consist of a 96′ incline shaft and three tunnels, 130′, 335′, and 350′ long. The 5-ton furnace was in operation a few weeks in 1895, and produced 20 flasks. Three men are employed. Martin Bros. & Co., of Dublin, Alameda County, owners; John George and Robert Scott, of San José, Santa Clara County, lessees.

Trinity County.

Altoona Quicksilver Mine.—See our Xth and XIIth Reports, pp. 716 and 371. The property consists of three claims in T. 38 N., R. 6 W., 16 miles W. of Castella, Shasta County, and 22 miles N.E. of Trinity Center. The ore-body, as traced on the surface, trends N. and S. in a porphyritic matrix adjoining a serpentine rock, with streaks and veinlets of cinnabar in conjunction with calcite and quartz; six or eight such seams, all pitching W., are known in a belt about ¼ mile wide. The "alta" is found on the hanging-wall; the greater proportion of the ore-bearing material is soft, decomposed, and clayey. A complete plant has been erected since our last Report, consisting of a Knox furnace, 32′

6″ high, 30′ wide, and 68′ long, capable of handling 30 tons in twenty-four hours. There are twelve iron double condensers of the Knox & Osborne pattern, and three wooden ones; a drier 10′ square, capable of handling 16 tons a day, is built of brick, with sloping iron gratings below each other, permitting the ore to descend from one to the other. The heat from the fire place passes through perforated brick-work in the walls, before escaping, requiring only ½ cord of wood per day. The furnace consumes 3 cords; 600 cords of wood are in store. A 60 H.P. engine furnishes the power, with a consumption of 3 cords of wood per day, for the hoist and a 10″ pump, making 4 strokes per minute in summer, but nearly double that in winter. The shaft, 10′ x 12′ and 237′ deep, has a gallows frame 89′ high, with three stations above the collar of the shaft; one leading to the drier, one to the furnace, and the topmost one to the dumps. On account of the high altitude and climatic conditions, the entire plant, as well as the drying floors, tracks, timber, and wood, are closely housed, permitting work to proceed during winter. From the condensers an 80′ flue extends up the mountains, terminating in a 30′ stack. The ore is said to carry 4% of metal. Seventy-five men are employed; 50 in the mine, 7 at the furnace, and the remainder on the drying floors and in the workshops. The number of men varies with the seasons. An incorporated company, of No. 206 Sansome Street, San Francisco, owner; J. P. Stidger, of Cinnabar, superintendent.

Integral Mine.—See our XIIth Report, p. 372. This property adjoins the Altoona Mine, 22 miles N.E. from Trinity Center. Idle. An incorporated company, owner.

Cinnabar occurs near New River City. No developments.

Yolo County.

Reed Mine.—See our Xth Report, p. 793. It is on Davis Creek, near the western boundary of the county. It was extensively worked a number of years ago, and preparations are being made to resume working. Merchants Exchange Bank, of San Francisco, owner.

SILVER.

Inyo County.

See under head of Argentiferous Galena.

Kern County.

Amalie Mine.—See our XIIth Report, p. 141. It is at Amalie, 14 miles E. of Caliente, at 2,850′ altitude. The vein occurs in a porphyry belt, about 300′ wide, which strikes N. 66° W., and dips 80° N. between a granite foot-wall and a hanging-wall of much decayed eruptive rock. The vein averages 24″ in width, and consists of quartz with ruby silver, tetrahedrite, and silver glance. The incline shaft is 330′ deep, and is being widened and retimbered for two 4′x 4′ compartments. A 60 H.P. hoist is partly in position. The plant, of about 16 tons daily capacity, consists of a small breaker, a 5′ Huntington mill, and one Woodbury and two Frue vanners, driven by a 20 H.P. engine. Some gold is caught on the plates; the bulk, however, is in the concentrates. The bullion contains about 80% silver and 20% gold in value. Amalie Mining Co., owner; W. E. Rogers, of Amalie, superintendent.

Darling Rosa Mine.—It is in Amalie, at 2,920′ elevation. A 40′ shaft discloses a 14″ vein, dipping 85° N. between porphyry walls. Idle. J. B. Ferris, of Caliente, owner.

Ferris Mine.—It is on Caliente Creek, near Amalie, at 2,800′ altitude. The vein is 3′ thick, dips 85° N. between porphyry walls, and consists of quartz carrying silver and a little gold. There is an 85′ shaft, with a 20′ drift at the bottom. J. B. Ferris, of Caliente, owner.

Iconoclast Mine.—See our XIIth Report, p. 145. It is on Badfish Creek, 10 miles E. of Isabella. The vein is bunchy, varying from a few inches to 12′ in width, and is soft, rotten quartz, carrying silver and a little gold. It is reduced in a 5-stamp water-power mill and a 10-ton cyanide plant. Stebbens & Porter, of Isabella, owners.

On the high peak 2 miles S.E. of *Isabella* several strong veins occur which carry an ore containing silver, antimony, and arsenic. Owing to the low price of silver nothing is being done with them.

Occidental Mine.—See our XIIth Report, p. 146. It is on Caliente Creek, 14 miles E. of Caliente, at 2,850′ altitude, and adjoins the Amalie. The two old shafts have been deepened to 100′, and some drifting has been done. A cross-cut tunnel, to be 550′ long, is now 400′ long. The vein is 1′ to 2′ wide, and dips 80° N. The ore, a chloride near the surface, changes to a sulphide in the deeper workings. James B. Parker, of No. 512 E. Twelfth Street, Los Angeles, owner.

Napa County.

Mount George.—Argentiferous galena float is found on the slopes of this mountain, near Napa, and also in American Cañon, 6 miles N.E. of Vallejo.

Mountain View (Napa Consolidated) Mine.—It is situated in Kings Cañon, 2½ miles N. of Calistoga, at 1,200′ altitude. The vein is said to be 9′ wide and to consist of quartz, with copper pyrite, rich in silver. The developments are a 515′ cross-cut tunnel and a 10′ drift on the vein. Idle several years, and partly caved. Dr. W. D. Smith, of Calistoga, owner.

Palisade (Grigsby) Mine.—See our VIIIth and XIIth Reports, pp. 413–415, and 396. It lies in Kings Cañon, 2½ miles N. of Calistoga, at 710′ altitude. Idle. Grigsby & Johnson, of Calistoga, owners.

Silverado Mine.—See our Xth and XIIth Reports, pp. 363 and 376. It is situated 5 miles N. of Calistoga. Idle many years. Alexander Badlam, of No. 513 Market Street, San Francisco, owner.

San Bernardino County.

The silver mining industry in this county is almost at a standstill, only a portion of the mines owned by the Silver King Co. (Ltd.) being in operation. There are numerous mines containing silver ores which could be profitably worked were silver worth a dollar per ounce or thereabouts, which can only be operated now at a loss. Following is a résumé of the various silver districts and mines:

Bismarck Mine.—See Occidental.

Black Metal Mine.—See our XIIth Report, p. 376. It is 50 miles S.E. of The Needles and 3 miles from the Colorado River. It produces copper and silver ore. Idle. Monaghan & Murphy, of The Needles, owners.

Blue Jacket Mine.—See our IXth Report, p. 230. It is 3 miles N.E. of Oro Grande, at 3,300′ elevation. The vein strikes N.E. and S.W. and dips S.E. There are two shafts, 40′ and 80′ deep, on the vein, which is 4′ to 8′ wide. The rock is white quartz, with considerable calcite, containing blue copper carbonate (azurite). Idle.

Bonanza King.—See our Xth Report, p. 532. It is in Trojan District, 25 miles N. of Fenner. At one time a large producer, but idle many years. The mine is 800′ deep. Present owners unknown.

Calico District.—See our VIIIth, IXth, Xth, and XIIth Reports, pp. 491, 224, 530, 337, and 376. It is 6 miles N. of Daggett and embraces the entire Calico range, including what is known as West Calico and East Calico, or the Borax District. There are mines containing chloride silver ores, and in some places lead ores are scattered all along the southern part of the range for a distance of 8 miles. The mineral belt is about 2 miles wide at the eastern end and narrows going westward, though its full extent has never been actually determined. In all this large field only two groups of mines are in actual operations, viz.: the *Oriental* and *Occidental* groups (q. v.). At the time of the last visit of the field assistant to the district it was noted that the violet-brown porphyritic liparite (locally called "birdseye") does not form a nuclear mass in the range, but occurs as a later intrusive and effusive rock, breaking through the older tufaceous breccias and tufas, and in the northern part of the region capping some of the hills, the sheets lying on the tufas. This is an important feature of the structural geology of the region never before noticed. On the east side of the district the borax mines are still working, and new deposits are being developed. Outside of the *colemanite* mines little is being done in the borax deposits.

Carbonate Mine.—It is ½ mile E. of Oro Grande. See under head of Argentiferous Galena.

Desert Queen Mine.—See Imperial Lode.

Grapevine District.—See our IXth and Xth Reports, pp. 223 and 531. It is W. of Calico District and N. of Barstow. It was discovered in 1880. Some prospecting has been done in the district within the past two years, and some silver-bearing deposits found, but no work of consequence done.

Humbug Mine.—See our VIIIth Report, p. 497. It is 2 miles N.E. of Calico. The ore occurs as impregnations in nearly horizontal beds of tufa, which have been worked extensively by a system of open cuts and underground stopes carried to shallow depths.

Imperial Lode.—See our XIth and XIIth Reports, pp. 351 and 376. It is in Lava Beds District, 36 miles E. of Daggett. The lode is exposed for a distance of 8,000′, cropping boldly above the surface the entire distance. It strikes N.E. and S.W. and dips N.E. The claims are the *Desert Queen*, *Mammoth Chief*, *Meteor*, *Morning Star*, and *Sampson*. The Mammoth Chief, Meteor, and Morning Star claims are extensively developed by tunnels, shafts, and open cuts; the other claims lying at each end of the lode have only a small amount of development. Assessment work only is now being done in the mines.

Ivanpah District.—See our Xth and XIIth Reports, pp. 531 and 376. It is 25 miles N.E. of Vanderbilt, near the Nevada State line. The silver mines of the district are idle.

Josephine Mine.—See Silver King.

Langtry Mines.—See our XIth Report, p. 343. They are 5 miles W. of Calico, and comprise a group of claims upon which considerable work has been done. The veins are fissures in tufa, and are the only veins in this district entitled to be called fissures. The strike is E. and W. and the dip 80° N. The tufa lies in nearly horizontal beds. The main filling is baryta and quartz containing chloride of silver, iron oxide, and carbonate of lead. Idle. T. N. Stebbins, of Daggett, owner.

Lava Beds District.—See our IXth, Xth, and XIth Reports, pp. 230, 529, and 349. It is about 35 miles E. of Daggett and 10 miles S. of Lavic. In the district are veins and deposits of silver, copper, and gold-bearing ores. The copper mine only is at present being worked. See Tiptop Mine under head of Copper.

Mammoth Chief Mine.—See Imperial Lode. Fred Clark, of Daggett, owner.

Meteor Mine.—See Imperial Lode. George W. Grayson, of San Francisco, owner.

Morongo (*Nichols*) *Mine.*—See our VIIIth, IXth, and Xth Reports, pp. 503, 228, and 526. It is 50 miles E. of Victor, in the San Bernardino Mountains. The vein is 4′ to 8′ wide. There are four shafts, 20′, 30′, 50′, and 100′ deep, respectively. Some drifting has also been done. Idle. Judge J. Nichols, of Los Angeles, owner.

New York District.—See our XIIth Report, p. 376. It is 3 miles W. of Manvel. All the silver mines of the district are idle.

North Camp.—See our IXth Report, p. 228. It is 7 miles N.W. of Oro Grande. All mines in the camp idle.

Occidental Group.—See our VIIIth Report, p. 497. These mines are 2 miles N.E. of Calico, at about 3,600′ elevation. The most important mines of the group are the *Argonaut*, *Bismarck*, *Cleveland*, *Garfield*, *Invincible*, *Runover*, *Thunderer*, and *Veto*; all of which have been worked extensively. The surface cuts are of large size, and some of the stopes are of unusual dimensions, and without a stick of timber or artificial support of any kind. One tunnel has been driven over 4,000′, cutting through the Cleveland, Garfield, Occidental No. 1, Runover, and Veto mines. One hundred feet higher is a second tunnel, 2,500′ long. This group of mines has been worked constantly for years, and produces some very rich ore, besides a large amount that is low-grade. The ore-bearing formation is rhyolite tuff, locally called sandstone, and green liparite breccia, in part tufaceous. The ore deposition has taken place along certain lines of faulting and crushing, great chambered veins having formed on one side or the other of these fault-planes, and occasionally on both sides. In other instances deposits have taken place between two converging fissures. The ores are hauled 2 miles by wagon to the mill near Calico. Silver King Mining Co. (Ltd.), of London, owner; William S. Edwards, of San Francisco, manager.

Odessa Group.—See our XIth Report, p. 343. These mines are about 1½ miles N.E. of Calico, at 3,200′ elevation. The principal claims are the *Dragon Nos. 1 and 2*, *Dunderberg*, *Gobler*, *Little Jane*, and *Odessa*. All are extensively developed, and have been large producers. They are at present idle. Silver King Mining Co. (Ltd.), of London, owner; William S. Edwards, of San Francisco, manager.

Oriental Group.—See our VIIIth and XIth Reports, pp. 497 and 344. It lies just back of the town of Calico, on the south flank of the King Hill. The principal mines are *Oregon No. 3*, *Oriental Nos. 1, 2, 3, 4, and 5*, *Red Cloud*, and *Wall Street*. The development has been made mostly through tunnels entering the mountains from Wall Street Cañon. A winze has been sunk 200′ below the lowest adit. The ore-shoots have formed here both as impregnations, as described in the Occidental group, and as veins in liparite breccia, the vein-filling being chiefly baryta and iron oxide. These mines are in active operation. There still remains considerable unprospected territory in which ore-shoots are expected. It is expected an air-compressor will be added to the surface plant and a hoist will be set up underground, which will be operated by means of air, and the unknown territory prospected. Silver King Mining Co. (Ltd.), of London, owner; William S. Edwards, of San Francisco, manager.

Oro Grande (Silver Mountain) District.—See our IXth, Xth, and XIth Reports, pp. 230, 527, and 360. It lies E. of the Southern California R. R., the nearest station being Oro Grande. The mines of the district produce gold, lead, silver, and copper. No silver mines are at present in operation, except the Carbonate Mine. See Argentiferous Galena.

Providence District.—See our IXth, XIth, and XIIth Reports, pp. 223, 519, and 376. It is N. of the A. & P. R. R., the nearest station being Fenner. No silver mines are in operation.

Red Jacket.—See Silver King.

Rising Sun Mine.—See our IXth Report, p. 232. It is in Lava Beds District, 35 miles E. of Daggett. Idle. — Wallace, of Alhambra, owner.

Sampson Mine.—It is an idle claim on the Imperial Lode in Lava Beds District. Samuel Blair, of Daggett, owner.

Silver King Group.—See Waterloo Mining Co.

Silver King Mining Co. (*Ltd.*).—It owns the *Occidental*, *Odessa*, and *Oriental* groups of mines, and the *Silver Monument Mine* at Calico. They are operated under one management, all the ore being crushed in the company's 30-stamp mill (Boss process). Water is obtained by pumping from a well sunk in the desert wash south of the mill. Both wood and coal are used as fuel. The boiler and engine are 125 H.P., though less than this amount is actually used. The installment of air-compressors for the purpose of running hoists and fans in the mines is under consideration. The salt used in milling operations is from the salt beds 30 miles S. of Danby. Silver King Mining Co. (Ltd.), Crocker Building, San Francisco, owner; William S. Edwards, of San Francisco, manager.

Silver Monument Mine.—See our VIIIth Report, p. 497. It is in Calico. The ore occurs as an impregnation in a great mass of white, ashy, rhyolite tufa. It has produced a large amount of ore since 1887, but is now idle. Silver King Mining Co. (Ltd.), of London, owner; William S. Edwards, of San Francisco, manager.

Silver Mountain District.—See Oro Grande.

Silver Reef District.—See our XIth and XIIth Reports, pp. 365 and 377. It is at the northern base of Black Hawk Mountain, 40 miles E. of Victor. There are a large number of claims in the district on which more or less work has been done. Some of the mines produce high-grade silver ore, and also some gold rock. Assessment work only is done.

Trojan District.—See Providence.

Tiptop Mine.—See our XIth and XIIth Reports, pp. 354 and 69. It is in Lava Beds District, and is a copper-silver mine, which is worked in a small way. W. H. Masters et al., of Cleveland, Ohio, owners; W. Steadman, of Daggett, superintendent.

Waterloo Mining Co. (*Silver King*) *Mines.*—See our VIIIth, XIth, and XIIth Reports, pp. 498, 339, and 376. These properties are on the north side of Wall Street Cañon, near Calico, at 3,500′ elevation. The principal claims are the *Josephine*, *Red Jacket*, and *Silver King*. They were largely worked and very productive in former years, but have of late been idle, or worked in a small way by lessees. The company's mills are near Daggett, 6 miles N. of the mines, where there are a 15-stamp mill, called the Oriental, and a 60-stamp mill, known as the Waterloo. The mills are connected with the mines by a narrow-gauge railroad. Waterloo Mining Co., of Milwaukee, owner; W. H. Hardy, of Daggett, agent.

Waterman Mines.—See our Xth Report, p. 531. They are in Grapevine District, 4 miles N. of Barstow. The *Waterman* is the principal mine of the group. All the mines have been idle since 1886. Waldo S. Waterman, of San Diego, owner.

West Camp.—See our XIIth Report, p. 26. It is 12 miles W. of Oro Grande. The veins contain silver ore, and some of them lead. All are idle.

San Mateo County.

Redwood City.—Some years ago (see our Xth Report, p. 591) a well was bored 560′ in depth to obtain a supply of water for municipal purposes. *It is unauthoritatively stated* that at a depth of 215′ a stratum, thickness not given, of galena ore was encountered which assayed 42% lead and $48 per ton in gold and silver. At 330′ an 8′ stratum of red rock was reached which assayed $55 per ton in gold and silver. At 439′ a 10′ stratum of sedimentary deposit was encountered which contained native silver and assayed from $400 to $1,000 per ton. A specimen of this is in the Museum of this Bureau. At 540′ the drill entered quartz, which continued to the bottom and assayed $46 per ton in gold and silver. It has been intimated that the rock was "salted," but the well-borer, Mr. S. Haley, of San Francisco, said that he was quite certain that the quartz rock was not.

Argentiferous galena is found at other points, viz., at *Searsville*, at the *Larce* claim, near Redwood City, and also 4 miles W. of Menlo Park. It would seem, therefore, that it is not improbable that silver might be found in paying quantities in San Mateo County as a result of intelligent and systematic search.

Shasta County.

Afterthought Mine.—See our XIIth Report, p. 377. It is a patented claim at Furnaceville, on North Creek.

Black Prince Mine (Quartz)—.It is 2 miles N.W. from Igo, at 1,400′ elevation. It is a contact vein, between granite and slate, coursing N.E. and S.W., and dipping 45° E. The walls proper are 100′ apart; the vein consisting in part of 37′ of quartz, while in other portions the quartz forms into several distinct seams. A shaft has been sunk 110′ and drifted from, 115′ E. and 75′ W. The hoist is a horse-whim, and the mine water is bailed by buckets. A 40′ cross-cut has been run. Assessment work only. One man is at work. S. W. Robinson, of Igo, owner.

Bully Hill (*Copper City*) *Mine.*—See our XIIth Report, p. 377. It is 3 miles N. of Copper City, and comprises three claims. Idle.

Extra Mine.—See our XIIth Report, p. 377. It is ¼ mile from Copper City. Idle.

Last Chance Mine.—See our XIIth Report, p. 377. It is on North Cow Creek, 9 miles N. of Round Mountain.

Northern Light Mine.—See our XIIth Report, p. 377. It is 1¼ miles from Copper City. Idle.

Recorder Mine.—See our XIIth Report, p. 377. It is 3 miles N. of Copper City. Idle.

South Fork Mining and Milling Co.'s (*Black Prince*) *Mine.*—See our XIIth Report, p. 377; also see Black Prince Mine.

Winthrop Mine.—See our XIIth Report, p. 378. It is ½ mile N. of Copper City. Idle.

Tulare County.

Black Prince Mine.—See our XIIth Report, p. 296. It is in Redwood Cañon, 6 miles E. of Badger, at 2,600′ elevation. The vein is filled with a hard garnetiferous rock, carrying silver and copper. It is 5′ wide and lies between walls of talcose slate. Development consists of a shaft 50′ deep and a tunnel 150′ long. E. Walters, of Badger, owner.

Bluebird Mine.—See our XIIth Report, p. 296. It is in Redwood Cañon, 8 miles E. of Badger, at 2,700′ altitude. The vein is 4′ wide and consists of a hard silicious matter. The country rock is talcose slate. There are two tunnels, 65′ and 200′ long, on the vein. Kirkland Bros., of Auckland, owners.

Domingo Mine.—See our XIIth Report, p. 296. It is in Redwood Cañon, at 2,550′ altitude, and near the Black Prince. The ore and associations are similar. E. Walters, of Badger, owner.

Gray Eagle Mine.—See our XIIth Report, p. 296. It lies in Redwood Cañon, 6 miles E. of Badger, at 2,800′ altitude. The development consists of a 60′ shaft and a 150′ tunnel. The vein is 4½′ thick and is a hard, epidote-garnet rock, with galena and chalcopyrite. The country rock is talcose slate. W. Hart, of Badger, owner.

Hart Mine.—This is an extension of the Gray Eagle. Idle. W. Hart, of Badger, owner.

Mineral King Mines.—See our VIIIth Report, p. 645. They lie in the high Sierra, 60 miles E. of Visalia. The ore is refractory galena and zinc-blende, carrying about 40 ozs. of silver per ton and a little gold.

STRUCTURAL MATERIALS.

BASALT.

Napa County.

Columnar Basalt occurs in Clark's Cañon, 12 miles W. of Napa, on the land of Charles Clark, of Napa.

Columnar Porphyry is found on the eastern slope of Mount Helena, 6 miles W. of Kellogg. Columns, 3″ to 5″ diameter, are found, 4′ to 6′ long. The rock is hard and brittle and of a gray color, and stained.

CEMENT.

San Bernardino County.

California Portland Cement Works.—See our XIIth Report, p. 380. These are ¼ mile W. of Colton, at 1,000′ elevation. The limestone used in the manufacture of the cement is quarried from a hill situated immediately back of the works. The quarry is connected with the manufacturing plant by an inclined tramway about 1,000′ long, and rising 600′ to near the summit of the hill. The plant, consisting of four Griffin mills, two revolving oil-burning furnaces of the Duree type, and all the other necessary pulverizing and conveying machinery, etc., is located at the side of the Southern Pacific R. R. The limestone, said to be almost pure, is mixed with a certain proportion of clay and fluor-spar from the Castle Dome mines in Arizona, pulverized and roasted at an intense heat. A semi-clay-like mass, or "clinker," is the result. This is cooled, re-ground, and sacked for shipment. A very complete laboratory and testing-room is connected with the establishment. Seventy-five men are employed. The capacity of the works is said to be 200 bbls. per day. California Portland Cement Co., of Los Angeles, owner; F. N. Spear, of Colton, superintendent.

Solano County.

Benicia Works.—See our XIIth Report, p. 380. Idle. J. G. Johnson and James Clyne, of Benicia, owners.

CLAY, BRICKS, POTTERY, ETC.

Alameda County.

California Pottery and Terra Cotta Co.—See our XIIth Report, p. 381. Its works are on Twelfth Street, in East Oakland. There are two kilns, 18′ and 16′ in diameter, fired with wood. Sewer and chimney pipe, flower-pots, vases, tiles, fire-bricks, stove linings, etc., are manufactured. The clay used is obtained from Carbondale, Amador County. Eleven men are employed in the works. S. W. Winsor, of Oakland, manager.

N. Clark & Sons' Pottery.—See our XIIth Report, p. 381. It is in the City of Alameda, and consists of eleven kilns—two 25′ in diameter, eight 20′, and one still smaller. A Whitacre machine for making pressed bricks is being erected. The company manufacture vast quantities of vitrified sewer and water pipe, chimney pipe and tops, fire-proofing, etc. The clays are principally obtained from Carbondale, Amador County. N. Clark, President; George A. Clark, of No. 13 Spear Street, San Francisco, secretary.

Oakland Art Pottery.—It is on Twelfth Street, between Twenty-second and Twenty-third avenues, Oakland. There are three kilns—one 20′ and two 18′ in diameter. All sorts of ornamental vases, flower-pots, chimney pipes and tops, standard sewer-pipe, ornamental tiling, water-coolers, and general terra cotta wares are manufactured. The clays used are principally obtained near Carbondale, Amador County. Twenty-nine men are employed. James Miller, of No. 1125 E. Twelfth Street, Oakland, proprietor.

Remillard Brick Co.'s Works.—See our XIIth Report, p. 381. They are on the S. P. R. R., 1½ miles N.E. of Pleasanton. There are two sixteen-compartment Hoffman kilns of 20,000 daily capacity each. But one kiln is now in operation. Only common bricks are made. They are made from a superficial deposit of sandy loam, 25′ thick, which is near the kilns. Sixty men are employed during summer. P. H. Lamoureux, of Oakland, secretary; E. R. Sinard, of Pleasanton, superintendent.

Amador County.

In the vicinity of Carbondale are large and numerous deposits of clay of superior quality, and also of sand. In these deposits large excavations have been made at many points, and the material shipped to potteries and pressed-brick works throughout the State, large quantities going to Alameda, San José, Sacramento, and even as far as Los Angeles. The total annual shipment of clay alone from Carbondale is about 16,000 tons. Sand, up to the present time, has been shipped in limited quantities to iron foundries, where it is used in molding. This branch of the industry will doubtless grow into greater proportions as the peculiar fitness of this sand for the purpose becomes better known.

Carbondale Pottery.—These works are at May P. O., 1 mile from Carbondale Station. There is but one furnace, and this is fired intermittently. Drain-pipe, terra-cotta chimney tops and pipes, fire-bricks, and a line of stoneware, jugs, jars, etc., are the principal articles manufactured here. Fred Hammer, of May P. O., owner.

N. Clark & Sons' Clay-pits.—These are scattered within a radius of 3 miles of Carbondale Station. They are worked constantly, except during the rainy season. To provide the necessary supply during the winter months, several thousand tons are mined and placed under cover during summer. N. Clark & Sons, of Alameda, owners.

Heath & Smith's Clay-pits.—They are in the vicinity of Carbondale, and supply large quantities of clay, of which there are several qualities, to potteries and terra cotta works throughout the State. During the summer months 4,000 tons will be housed for shipment during winter, when the rains make it impossible to dig or ship the clay from the pits. Heath & Smith, of May P. O., owners.

Butte County.

Walker's, W. A., Brickyards.—They are 3 miles S.E. of Chico, and supply the local markets at Biggs and Gridley. A superficial deposit of sandy loam, 3′ to 6′ thick, lying between the surface soil and underlying sand, is used successfully. Where hardpan occurs beneath the loam, as is the case in many places, it is said to contain too little sand to make good bricks.

Contra Costa County.

Mount Diablo Pottery and Paving Brick Co.'s Works.—They have been recently established on the railway, ½ mile W. of Antioch. The company will manufacture paving and pressed bricks, terra cotta, fire-proofing, sewer-pipe, flower-pots, roofing-tiles, etc. The clays used are from stratified beds in the foothills, S. and W. of the pottery, and, so far as they have been tested, are said to be satisfactory. E. T. Maple, of Antioch, superintendent.

Kern County.

The Bakersfield Patent Brick Co. of Bakersfield made about 600,000 bricks during 1895.

Los Angeles County.

The manufacture of bricks and terra-cotta ware has been greatly stimulated by the use of oil as fuel, and by the increasing demand for structural material. The Pliocene formations around Los Angeles afford an inexhaustible supply of clay suitable for brick, and for mixing with other clays in the manufacture of terra-cotta ware.

Berg & Loyne's Brickyard.—It is at Los Angeles. An open kiln, fired by wood, is used, with a capacity of 8,000 bricks a day. Output for 1895, 1,500,000 bricks. Ten men are employed. Berg & Loyne, of No. 125 W. Second Street, owners.

California Sewer-Pipe Co.'s Brickyard.—It is at Vernon, 1 mile S. of Los Angeles. There are three down-draught kilns—one of 20′ and two of 28′ diameter—in which oil for fuel is used. Sewer-pipe, water-pipe, flue-lining, fire-bricks, drain-tiles, etc., are manufactured. The clay is obtained from near Elsinore, Riverside County. Twenty-six men are employed. California Sewer-Pipe Co., owner; T. M. Riley, of No. 649 S. Broadway, manager.

Capitol Steam Brick Works.—Located at Los Angeles. An open kiln, fired by wood, coal, and oil, is used. Its capacity is 40,000 bricks a day. Forty men are employed. E. Simons, of No. 125 W. Second Street, owner.

City Brick Co.—See our XIIth Report, p. 381. Its yard is located in Los Angeles, and employs an open kiln, fired with wood. Its capacity is 38,000 bricks a day. Thirty-five men are employed. A. A. Hubbard, of No. 125 W. Second Street, manager.

Davin's Brickyard.—It is in Los Angeles, and uses an open kiln, fired with wood. Its capacity is 12,000 bricks a day. Twelve men are employed. P. Davin, corner Saratoga and Brooklyn streets, Boyle Heights, owner.

Eureka Brick Co.—Its open kiln is located in Los Angeles, and heated with oil. Its capacity is 18,000 bricks a day. Fifteen men are employed. W. R. Gleason, of No. 127 W. Second Street, superintendent.

Forrester's Brickyard.—It is in Los Angeles, and uses an open kiln, fired with wood, coal, and oil. Its capacity is 8,000 bricks a day. Six men are employed. C. Forrester, of No. 125 W. Second Street, owner.

Gamble's Brickyard.—It is at Garvanza. An open kiln, fired with wood, is used. Its capacity is 8,000 bricks a day. Eight men are employed. J. M. Gamble, of Garvanza, owner.

Houlahan & Griffith's Yard.—It is at Inglewood. They employ two Boenehke continuous kilns, fired with oil and coal. Capacity, 12,000,000 bricks a year. Sixty men are employed. Houlahan & Griffith, of No. 208 Stimson Block, owners.

Jensen's Brickyard.—It is in Los Angeles, and uses open kilns, fired with wood. Capacity, 38,000 bricks a day. Thirty men are employed. H. Jensen, of No. 130 W. Second Street, owner.

Joyce's Brickyard.—Located in Los Angeles. A continuous kiln, fired with coal, is used. Capacity, 24,000 bricks a day. Thirty men are employed. T. F. Joyce, of No. 125 W. Second Street, owner.

Karr Frampton & Co.'s Brickyard.—It is at Los Angeles. Uses an open kiln, fired with oil. Capacity, 16,000 bricks a day. Eighteen men are employed. Karr Frampton & Co., of No. 125 W. Second Street, owners.

Los Angeles Pressed Brick and Terra Cotta Co.'s Works.—They are located at Los Angeles. Employ five down-draught kilns, fired with an oil "distillate" of 24° B. Twenty men are employed. Company's office, No. 119 S. Broadway; L. F. Miller, superintendent.

Monarch Brick Co.'s Yard.—It is at Los Angeles. Uses open kilns, fired with wood and oil. Capacity, 34,000 bricks a day. Thirty men are employed. Whitman & Workman, of No. 127 W. Second Street, owners.

Pay Brickyard.—It is at Los Angeles, and uses open kilns, fired with wood. Capacity, 18,000 bricks a day. Twenty men are employed. C. Pay, corner Mott and Seventh streets, Boyle Heights, owner.

Pierson & Anderson's Brickyard.—It is at Los Angeles. Uses an open kiln, fired with wood and coal. Capacity, 8,000 bricks a day. Eight men are employed. C. Schroder, of Pico Heights, owner.

Simon's Brickyard.—It is at Los Angeles. A Hoffman continuous kiln, fired with coal-slack and wood, is used. Capacity, 25,000 bricks a day. Thirty men are employed. R. Simons, of E. Seventh Street, near Boyle Avenue, owner.

Marin County.

There are three large brick plants in this county, all within a few miles of San Rafael, and accessible to tidewater. They were fully described in our XIIth Report, p. 382, and are as follows: The *Fortin Brick Co.*, the *Patent Brick Co.*, and the *Remillard Brick Co.*

Mono County.

Gorman's Deposit.—It is 1 mile S.E. of Bodie, and is very extensive, proven by a 190′ tunnel and various cross-cuts. It is hard and soft in places, of many colors, and estimated to be 60′ to 80′ thick. Locally used for brick. Hugh Gorman, of Bodie, owner.

Placer County.

Gladding, McBean & Co.'s Potteries.—See our IXth and XIIth Reports, pp. 297 and 382. They are at Lincoln, at 170′ elevation. All sorts of architectural terra cotta, vitrified sewer-pipe, 3″ to 30″ in diameter, vases, flower-pots, hollow tile, fire-proofing, pressed and fire brick, etc., are made. The works consist of a 150 H.P. engine and 4 boilers; 16 down-draught kilns; the necessary mixing, grinding, and pugging mills, etc.; and a Boyd's brick-press, for manufacturing pressed brick in the semi-dry way, has been recently added and is in successful operation; 80 tons pressure is said to be applied on each brick. A large quantity of fuel is required. The supply of wood is decreasing, and is being replaced by oil under the boilers and coal in the kilns. The clays (kaolin) used are principally obtained from two large pits at the eastern end of a low ridge 1 mile N. of the pottery. The following section is shown in the southern pit:

Soil	1′
Volcanic breccia	12′
Light, sandy clay	8′
Fine sand	4′
Sandy yellow clay	7′
Sandy clay with gravel	6′
Clay.	

The following section is of the northern pit:

Soil, etc.	2′
Volcanic breccia	10′
Fire-clay (for fire-proofing, etc.)	10′
Pipe-clay (for sewer-pipe, etc.)	6′
Fine white terra cotta clay	20′

The clay is excavated in the northern pit to a depth where water interferes. The extent of the deposit is unknown. A hole 60′ deep, bored in the bottom of the pit, is said not to have reached the bottom of the clay, and it is said to underlie the town of Lincoln, where it has been penetrated by wells. One hundred and fifty-six men are employed. J. R. Chambers, of San Francisco, secretary; A. J. Gladding, of Lincoln, superintendent.

Riverside County.

Elsinore Coal and Clay Co.'s Works.—They are 6 miles W. of Elsinore, at 1,200′ elevation. The several pits are near the Elsinore (*Chaney*) coal mine. About 5,000 tons of clay have been shipped to manufacturing establishments. Should the Southern California R. R. extend its tracks to this locality the industry is likely to become one of importance. D. W. McCrea, of Elsinore, superintendent.

McKnight Clay Works.—It is 4 miles S.W. of South Riverside, at 1,200′ elevation. The clay is of the indurated variety, and occurs as a bed in the Tertiary rocks, having a dip conformable to the sandstone. The clay-pits near Elsinore and in Temecula Cañon are mostly Quaternary deposits. The clay is shipped to the pipe-works at South Riverside and to the terra cotta works at Los Angeles. The output at present is 200 tons per month. J. H. McKnight, of South Riverside, owner.

Pacific Clay Manufacturing Co.'s Works.—They are in Temescal Cañon, 12 miles E. of South Riverside. Several pits are opened in this locality and the clay shipped by wagons to South Riverside, where the pipe-works of the company are located. M. Findlay, of South Riverside, superintendent.

Sacramento County.

Capital Sewer-Pipe Works.—See our Xth Report, p. 509. They are in the eastern part of the City of Sacramento. They consist of two down-draught kilns, 18′ to 20′ in diameter, and a Vaughn sewer-pipe press, of 600 to 1,800 pieces daily capacity, depending upon the size of pipe. The clay used is obtained near Carbondale. Nine men are employed. George Muddox, of Sacramento, owner and manager.

Fountain Bros.' Brickyard.—See our Xth Report, p. 508. It is in the southern part of the City of Sacramento. A superficial deposit of loam, clay, and sandy clay, 6′ thick, is used for making bricks. It varies in character from loam at the top, through clay, to sandy clay at the bottom, which, by thoroughly mixing, forms good material for bricks. About 1,000,000 bricks are burned annually in common kilns. Ten men are employed when working. W. A. Fountain, of Sacramento, manager.

Krewzberger & Harvie's (Ryan) Brickyard.—It is near Fountain Bros.' yard, in the southern part of the City of Sacramento. Dark sandy loam, 6′ to 10′ thick, is used; 200,000 bricks are burned per month, or 2,000,000 per annum, in common kilns. Twenty-four men are employed. N. Harvie, of Sacramento, manager.

Sacramento Transportation Co.'s Brickyard.—See our Xth and XIIth Reports, pp. 506 and 383. It is at Riverside, on the Sacramento River, 5 miles below the City of Sacramento. The works consist of five brick-machines of 30,000 daily capacity each; two sixteen-compartment Hoffman kilns of 50,000 daily capacity each; a dredger for excavating, and a railroad for transporting the clay from the pits to the works. A 12′ superficial deposit of loam, clay, and sandy clay is used. It is partially mixed by the steam shovel which fills the pits in the lowlands. The demand for bricks now being limited, the works are run intermittently. When running full-handed 160 men are employed, principally Chinese. Frank Dwyer, of Sacramento, secretary; J. O'Neil, of Sacramento, superintendent.

San Joaquin County.

The agricultural industries are most important, and, with this fact in view, the Stanislaus and San Joaquin Water Co. developed their irrigation canals during the summer of 1895. Manufacturing industries about Stockton, where shipping facilities are good, are also very important sources of revenue. The natural economic mineral resources at present developed consist principally of the well-known natural gas at Stockton, manganese in the western foothills, and brick-clays near the San Joaquin River. A good supply of water may be had from wells, 80′ to 150′ deep, in most parts of the valley lands, and flowing wells are obtained throughout the central part of the valley at about 1,000′ in depth.

Fine, earthy clay occurs in places in the San Joaquin Valley, which, if properly selected, is suitable for making bricks. A number of clay beds suitable for bricks, etc., have been penetrated by wells in Stockton and vicinity, but their depth has prevented their exploitation.

San Joaquin Brick Co.'s (San Joaquin Improvement Co.'s) Yard.—See our VIIIth and XIth Reports, pp. 561 and 394. It is on the San Joaquin River, 5 miles S.W. of Stockton. The material used is a superficial deposit of fine, earthy clay, which contains enough iron to color the bricks bright red. The clay is mined by dredging; the bricks are made in a Potts machine of 40,000 daily capacity, and burned in a fourteen-chamber Hoffman kiln of 18,000 daily capacity; coal is used for fuel. Fifteen to forty men are employed. C. Horton, of Stockton, secretary; F. W. Muller, of Stockton, superintendent.

Stockton Terra Cotta Co.'s Pottery.—See our XIth Report, p. 394. It is at Stockton. Terra cotta, sewer-pipe, etc., are manufactured. The clay used is mined at Valley Springs, Calaveras County. Idle. W. C. Morgan, of Stockton, superintendent.

San Luis Obispo County.

Ah Louis' Brickyard.—It is 1 mile W. of San Luis Obispo, at about 300′ altitude. Superficial loam is used; the bricks are made by hand, and burned in common kilns. About 800,000 are made per annum for the local demand. Eight Chinese are employed.

Santa Clara County.

Dreischmeyer's, H., Brickyard.—It is on Coyote Creek, in the suburbs of San José. Common stock and pressed bricks are made from a superficial deposit of sandy clay, and burned in a Hoffman kiln; 1,250,000 bricks were burned in the summer of 1895, and 25 men were employed.

Peterson's Brickyard.—It is on the S. P. R. R., in the southern part of San José. Common and pressed bricks are made from a superficial deposit of sandy clay, 25′ thick, on Coyote Creek, 1 mile E. of the yard. Two patent kilns are used. About 300,000 pressed and 3,000,000 common bricks are made annually. Fifty-five men are employed in summer. T. W. Peterson, of San José, manager.

Remillard Brick Co.'s Yard.—It is on the east side of Coyote Creek, in the southeastern part of San José. Common stock and pressed bricks are made. The company owns 170 acres, on which is a heavy superficial deposit of clay suitable for making bricks. A Hoffman kiln is used. The clay is hoisted from the pit by steam-power and transported in side dumping cars to the yards. The works were in operation four months in 1895, and 60 men were employed. C. Sunard, of San José, superintendent.

San José Brick Co.'s Yard.—This company have two Hoffman kilns on the Narrow-Gauge Railroad, 1 mile W. of San José. A total of about 12,000,000 common and pressed bricks are produced annually. One hundred and fifty men are employed in summer and thirty in winter. J. M. O'Keefe, of San José, superintendent.

Santa Cruz County.

There is a great variety of clays in this county that have only been tested in a few cases, and but little is known of their general utility. A large percentage of them are indurated, and occur in the form of argillaceous or clay shales. From their light color and general appearance they are locally known as "chalk rock," but are by no means a chalk. They occur in the hills and bluffs about Santa Cruz and elsewhere in the foothills facing the coast. Satisfactory experiments have been made with an indurated clay occurring in large masses, though undeveloped, on the *Hodge ranch*, 1½ miles S. W. of Glenwood, and near the railway. See our Xth and XIIth Reports, pp. 625 and 383.

McCabe Brickyard.—It is situated on the San Lorenzo River, about 1 mile N. of Santa Cruz. Three kilns were burned in the summer of 1895, producing about 422,000 bricks, principally used in the construction of the new court-house in Santa Cruz. The clay is 15′ to 20′ thick, overlies a bed of sand, and consists of the disintegrated mass of granitic rocks and shales transported from above by water. Just sufficient iron is contained to give the bricks a bright red color. R. M. McCabe, owner; A. G. Bowman, of Santa Cruz, superintendent.

Hihn's, F. A., Brickyard.—See our XIIth Report, p. 383. It is on San Lorenzo Creek, near Felton. Seventy-five thousand bricks were burned in 1895.

Shasta County.

Holt & Gregg.—This firm has brickyards located at *Anderson* and *Redding*. At the Anderson yard, situated 2 miles N. of town, a 30,000 per day brick-molding machine is to be put up. The past season 400,000 bricks were burned. Molded and stock bricks are made by the firm, which employs in the busy season as many as 250 men; 30 men are at work at present. Holt & Gregg, of Red Bluff, Tehama County, owners.

Solano County.

McKenzy & Reid's Pottery.—It is located in the town of Benicia, and only stove linings are manufactured. The clay worked is obtained principally from Ione, and a small quantity from Hoyt's farm, 1 mile N. of Goodyear's Station. The pottery is run intermittently, and 6 men are employed. J. McKenzy and M. Reid, of Benicia, owners.

Napa.—Clay of good quality and in large quantities exists, but is not utilized at present.

Union Pressed Brick and Terra Cotta Co.'s Works.—These extensive works are at Vallejo. There are four terra cotta and two brick kilns, with ample shed room. Idle. J. W. Pew, of No. 310 Pine Street, San Francisco, secretary.

Vallejo Hydraulic Pressed Brick Co.'s Works.—They are 1 mile N. of Vallejo. They consist of a large Hoffman kiln, hydraulic pressed brick machine, steam-engine, boiler, etc. Pressed brick were made from the clay shales obtained at the works. Idle. California Bank, of San Francisco, owner.

Tulare County.

At Visalia are two brickyards, owned by T. B. Craycoft and George Ballou, of Visalia. Their combined capacity is about 1,000,000 bricks per year.

GRANITE.

Madera County.

Day Quarries.—They are 2 miles S. of Raymond, and were thoroughly equipped in 1893, and worked for a time. Are now idle. Day & Sons, of Raymond, owners.

McLennan Quarries.—They are 1½ miles S.E. of Raymond, and have been worked steadily during the past three years, employing from 20 to 50 men. The quarry improves as it is opened, both in quality of the stone and in the size of the blocks which may be obtained. Blocks of granite, 25′x 25′x 10′, are available, if they could be handled. A. McLennan, of Raymond, owner.

Raymond Granite Quarry.—It is 1½ miles E. of Raymond, on a spur track of the railroad from Berenda to Raymond. This great quarry has been actively worked for several years, giving employment to a large number of men at the quarries and at the company's yards in San Francisco, where most of the finer stone-dressing is done. After an interval of over two years no considerable impression seems to have been made on this immense, dome-shaped, granite hill. Any noticeable change has been for the better. The great block referred to in our XIIth Report has been proven to be thicker as the front portion has been removed. It averages about 20′ in thickness now, 40′ and more in exposed width, and over 300′ in length; when this has been removed, a similar great concentric mass underlies it. The great advantage in this granite lies in its remarkably homogeneous texture. A slab 20′ in length, or even more, may be riven from a much larger block by the "feather and plug" system, none of the holes being over 3″ or 4″ deep, and the riven surface will be almost a perfect plane. Raymond Granite Co., owner; D. L. Knowles, of Raymond, superintendent.

Nevada County.

Pine Grove Quarry.—It is ½ mile E. of Nevada City, and comprises 2½ acres. It consists of the working of large bowlders of a fine-grained, hard granite, suitable for curbing, steps, bases to monuments, etc. One hand-derrick with 40′ boom is used. The output last year was 1,000′ of curbing. Two cutters are employed. E. D. Bridges, of Nevada City, owner.

Placer County.

A large area of granite rock ("grano-diorite" of W. Lindgren, of the U. S. G. S.) between Auburn and Roseville stretches northward, more or less disconnected, approximately to Bear River. It is extensively quarried about Rocklin, Loomis, Penryn, and Lincoln, and is used for general building purposes, and occurs in large masses, separated by that which is partially disintegrated. About Rocklin and Lincoln it is uniformly very light colored, and shows too little contrast between polished and rough surface. As the eastern boundary of the region is approached it becomes darker. It is said to resist great crushing force.

Borghese & Silvino's Quarry.—It is 2 miles N.E. of Lincoln. Street-curbing is worked from an outcrop or bowlder. Three men are employed. C. Borghese, of Lincoln, manager.

Brady's Quarry.—See our XIIth Report, p. 384. It is near Rocklin. Idle. — Brady, of Rocklin, owner.

Burlin & Temple Quarry.—It is a small quarry, 2½ miles N.E. of Lincoln. It employs 3 quarrymen, 3 stonecutters, and 2 hand-power derricks. William Burlin, of Lincoln, manager.

Burns (*Burns & Coffee*) *Quarry.*—See our XIIth Report, p. 384. It is a small quarry, 3 miles S.E. of Lincoln. Two steam-power derricks are used, and 3 quarrymen and 2 stonecutters are employed. M. Burns, of Lincoln, superintendent.

Calderwood's Quarry.—See our XIIth Report, p. 385. It is a small quarry, 1½ miles E. of Lincoln. Idle. — Calderwood, of Lincoln, owner.

Carlaw Bros.' Quarry.—It is 1¼ miles E. of Loomis, in Sec. 10, T. 11 N., R. 7 E., at about 375′ elevation. There are 17 acres in the property, on which is a vast quantity of light gray granite rock, used principally in building and cemetery work. One steam-power derrick is used. The rock is hauled to Loomis in the rough, at a cost of $7 per car, and shipped to Sacramento, where the cutting is done. Six men are employed at the quarry. A. W. Turner, of Loomis, superintendent.

Copp's (*Copp & Waters*) *Quarry.*—See our XIIth Report, p. 385. It is ½ mile S.E. of Rocklin, in the N.W. ¼ Sec. 29, T. 11 N., R. 7 E., at about 240′ elevation. The open cut is about 100′x 200′ and 80′ deep. Four steam-power derricks are used. The stone quarried is largely used for vaults, foundations, monuments, and buildings; 10 quarrymen, 5 stonecutters, and 3 laborers are employed. R. H. Copp, of Rocklin, owner.

Dunn's Quarry.—It is in Rocklin, on leased ground, in Sec. 29, T. 11 N., R. 7 E. Two horse-power derricks are used. Three men are employed, cutting curbing. D. Dunn, of Rocklin, manager.

Eureka Quarry.—See our XIIth Report, p. 385. It is in Rocklin, in the N.W. ¼ Sec. 29, T. 11 N., R. 7 E. The open cut is 75′x 200′ and 70′ deep. Three steam-power derricks are used, and 6 quarrymen and 6 stonecutters are employed. J. P. Allen, of Rocklin, manager.

Fletcher's, L., Quarry.—It is a small quarry on Granite Street in Rocklin, and worked intermittently. Nine men are employed when the quarry is operated. L. Fletcher, of Rocklin, owner.

Griffith Quarry and Polishing Works.—See our XIIth Report, p. 385. They are ½ mile E. of Penryn. Idle. D. Griffith, of Penryn, manager.

Grimes' Quarry.—It is a small quarry, 2 miles E. of Lincoln. Four men are employed, getting out curbing. Amos Grimes, of Lincoln, owner.

Hoyt's Quarry.—It is in the eastern part of Rocklin, in S.E. ¼ Sec. 29, T. 11 N., R. 7 E., at 265′ elevation. Four men are employed, getting out curbing. Howard Hoyt, of Rocklin, owner.

Hytimen & Wickman's Quarry.—It is ¾ of a mile S. of Rocklin, on leased land, in the N.E. ¼ Sec. 29, T. 11 N., R. 7 E. The open cut is 100′x 150′ and 60′ deep; one steam-power and two horse-power derricks are used. Four men are employed, getting out curbing. Hytimen & Wickman, of Rocklin, managers.

I X L (Jeter) Quarry.—It is 2 miles E. of Lincoln, at about 170′ elevation. The open cut is about 40′x 100′ and 40′ deep. Two horse-power derricks are used. The stone is used for cemetery and building purposes. There are 4 quarrymen and 8 stonecutters at work. T. H. Jeter, of Lincoln, owner.

Jacobson's Quarry.—It is a small quarry in Rocklin, 25′x 50′ and 30′ deep. One derrick is used, and 5 men are employed. — Jacobson, of Rocklin, manager.

Jeter Quarry.—See I X L Quarry.

Johnson's, M., Quarry.—It is a small quarry at Rocklin, in the S.E. ¼ Sec. 19, T. 11 N., R. 7 E. One horse-power derrick is used, and 4 men are employed, getting out curbing.

Kent Quarry.—See our XIIth Report, p. 385. It is at Rocklin, and practically abandoned.

Loomis Quarry.—It is ½ mile S. of Loomis, at 385′ elevation. The open cut is 60′x 150′ and 65′ deep. Two steam-power and two horse-power derricks are used. Five men are employed. M. J. Haley, of Loomis, owner.

Mantyla's Quarry.—It is at Rocklin, near the center of Sec. 19, T. 11 N., R. 7 E. The open cut is about 100′x 200′ and 40′ deep. Two steam-power derricks are used. It is worked intermittently, and 5 quarrymen and 5 stonecutters are employed when running. John Mantyla, of Rocklin, manager.

McDonald's Quarry.—It is a small quarry, 2½ miles S.E. of Lincoln. Four quarrymen and 2 stonecutters are employed. C. J. McDonald, of Lincoln, owner.

Quinn's Quarry.—See our XIIth Report, p. 385. It is at Rocklin. The open quarry is 125′ and 75′ deep. Two steam-power derricks are used. Three quarrymen, 3 stonecutters, and 2 laborers are employed. Mrs. Mary Quinn, of Rocklin, owner; Quinn Bros., of Rocklin, managers.

Roberts & Fippins' Quarry and Stone Works.—The works are at Penryn and the quarry is 1 mile S.E. of it. Gray granitic rock is quarried from a large outcrop, and the workings do not extend below the general surface. It is darker than the Rocklin granite, and shows a marked contrast between polished and rough surface. The works consist of a 14 H.P. engine and boiler, a double lathe for turning columns, urns, vases, etc., and machinery for polishing both flat and curved surfaces, moldings, etc. Three quarrymen, 3 stonecutters, and 3 millmen are employed. D. A. Roberts and A. B. Fippins, of Penryn, owners.

Rocklin Granite Co.'s Quarry.—See our XIIth Report, p. 386. It is at Rocklin, on leased land, in the S.W. ¼ Sec. 20, T. 11 N., R. 7 E. The quarry is 150′x 250′ and about 100′ deep. The equipment consists of five steam-power derricks, each of which is capable of hoisting blocks weighing 25 tons each, one traveling crane for handling stone in the sheds, one McDonald stone-cutting machine, one 40 H.P. engine and boiler. The "Knox blast" is used in the quarry. Ten quarrymen, 16 stonecutters, and 5 laborers are employed. E. M. Hall, Jr., of Oakland, secretary; J. L. Delano, of Rocklin, president and manager.

San Bernardino County.

Sherer Quarries.—They are 2 miles S. of Oro Grande, at the side of the Southern California R. R. John Sherer, of Victor, owner.

Eureka Granite Quarry.

Rocklin Granite Company's Quarry.

San Diego County.

Waterman Quarry.—It is at Fosters, the present northern terminus of the Cuyamaca and Eastern R. R. It was opened in 1894 for the purpose of quarrying massive blocks of stone for the jetty near Point Loma, at the entrance to San Diego harbor. The contract having been completed, the quarry is now idle and machinery removed. W. S. Waterman, of San Diego, owner.

San Luis Obispo County.

Lee's Quarry.—It is 4 miles N.W. from San Luis Obispo, at about 425′ elevation. The rock is a hard, light gray porphyry, in which the feldspar is partially decomposed. The trimmings for the court-house at San Luis Obispo are said to have been taken from this quarry, and considerable rock from it has been used for railway culverts, bridges, etc. The rock is broken by joint planes, which makes it more or less difficult to get good dimension stone. It is worked by an open cut, 25′x 75′ and 25′ deep. Idle. Charles Lee, of San Luis Obispo, owner.

Morro Rock Quarry.—It is near the base of Morro Rock, a conical-shaped peak at the entrance of Morro Bay, and is about 600′ altitude. The rock is a hard, light gray porphyry, in which the feldspar is slightly decomposed. It breaks regularly, and good dimension stone may be easily obtained. It is quarried by contract, and loaded from the quarry on barges by a steam-power derrick. The principal part of the rock quarried is used in constructing a breakwater at Port Harford, and a limited quantity for buildings. The quarry is on a Government reservation.

Shasta County.

Masterton Bros.' Quarry.—It is on Brandy Creek, 1½ miles S. of Stella. The granite is coarse-grained, dark, and similar to the Lincoln granite, in Placer County. Only bowlders are worked, into curbing and coping; the quality being hardly fine enough for monumental work. Pieces 2″x 10″x 10′ are produced. Four men are at work—2 quarrymen and 2 stonecutters. Masterton Bros., of Redding, owners.

Trinity County.

Rush Creek Quarry.—See our XIIth Report, p. 387. This is situated on Rush Creek, 6 miles E. of Weaverville, and contains 40 acres. At present only bowlders are worked. The granite is fine-grained, free from iron, and not very hard. Seven stonecutters are employed. Masterton Bros., of Red Bluff, Tehama County, owners.

Tulare County.

Griffith & Owens' Quarry.—See our XIIth Report, p. 387. It is 3½ miles E. of Exeter, on the S. P. R. R. and on the eastern base of Rocky Hill. Practically idle. Griffith & Owens, of Exeter, owners.

MACADAM.

Alameda County.

California Improvement Co.'s Quarry.—See our XIIth Report, p. 388. It is on the Laundry Farm, on the summit of a ridge, 1 mile N. of Mills College, at about 1,000′ elevation. A gravity tramway conveys the rock from the quarry to the crusher and bins at the terminus of the California R. R. The rock is a variety of basalt, and is used for macadam and concrete. Forty-five men are employed during summer. W. M. Rank, of No. 1003½ Broadway, Oakland, manager; Frank Fitzpatrick, of Fruitvale, superintendent.

Claremont Quarry and Paving Co.'s Quarry.—See our XIIth Report, p. 388. It is at Claremont, in the foothills between Oakland and Berkeley. The rock is a massive sandstone. The quarry is worked intermittently. Five men are employed.

East Oakland Contracting and Paving Co.'s Quarry.—It is on the side of a hill 3 miles E. of Oakland, and is worked intermittently. Twenty to forty men are employed when operating. E. P. Vandercook, of Ninth Street, near Broadway, Oakland, manager; W. O. Badgley, of Ninth Street, Oakland, secretary.

Haywards Contracting and Paving Co.'s Quarry.—It is 3½ miles S.E. of Haywards and ½ mile E. of the railroad. The rock is a metamorphosed gray sandstone, incorrectly called "blue trap." It is used for road and street work. The quarry is worked intermittently. Sixteen men are employed when operating. J. D. Smalley, of Haywards, manager.

Oakland Paving Co.'s Quarry.—See our XIth and XIIth Reports, pp. 125 and 388. It is on McAdam Street, near Broadway, Oakland. The rock is a metamorphosed sandstone, which contains more or less lime. It is extensively used for macadamizing and concrete work. There is a Gates and a Blake crusher, to which the rock is brought on incline by a steam-hoist. One crusher is now at work, crushing about 300 cu. yds. daily. Thirty-six men are employed, and when both crushers are running 50 men are required. Charles E. Blake, of Central Bank Building, Oakland, secretary; M. H. Eastman, superintendent.

Piedmont Paving Co.'s Quarry.—See our XIIth Report, p. 388. It is in the foothills near Piedmont. The rock is a grained metamorphosed sandstone, and is used for macadam and concrete. It has been idle for two years, but preparations are made to resume work. C. D. Bates, of Oakland, manager.

Los Angeles County.

Nearly all the macadam used in the City of Los Angeles is brought from a neighboring county.

Pacific Clay Manufacturing Co.'s Macadam Works.—They are situated at Los Angeles. In 1895 the output of crushed rock was 2,700 tons; price, $1 25 per ton. The rock is obtained from bowlders in the Arroyo Seco, in East Los Angeles. L. S. Porter, of No. 651 Broadway, secretary.

Marin County.

Forbes Quarry.—See our XIIth Report, p. 389. It lies at San Rafael. The plant consists of a Blake crusher, driven by a 16 H.P. engine. During 1895, 1,100 cu. yds. of macadam was made. E. Schwiesau, of San Rafael, owner.

Hotaling Quarry.—See our XIIth Report, p. 389. It lies at San Rafael. The rock is a tough blue sandstone, and is used for curbstones, gutter-blocks, macadam, etc. The product for 1895 was 5,000 cu. ft. of gutter-blocks, 2,000 cu. ft. of curbstones, and 100 cu. yds. of macadam. A. P. Hotaling, of San Rafael, owner; E. Schwiesau, of San Rafael, lessee.

Parrott Quarry.—See our XIIth Report, p. 389. Idle.

Sacramento County.

The Folsom State Quarry.—The site of the quarry which has been opened under the direction of the Bureau of Highways, is on the south side of the American River, on the ground of the State Prison at Represa. At the request of the Bureau of Highways a mineralogical and geological examination was made of the locality by W. H. Storms, Field Assistant of this Department. A synopsis of his report is here given. The excavation for the canal of the Folsom Water Power Co. has made a large and continuous exposure of rock in place, extending from the dam, half a mile above the prison, to a point a mile or more below it. An examination was made along this canal for a distance of 7,500′ to ascertain the character of the rock exposed and to determine its adaptability for macadamizing roadways. From the dam to a point a few feet south of the prison power-house the rock is all grano-diorite (locally called granite) of even texture and gray color. Where not decayed from surface weathering it makes a superior building-stone—all the prison buildings are constructed of it. At a point directly opposite the main entrance of the prison the grano-diorite gives place to a dark-colored amphibole rock, probably altered diorite. The contact is not sharply defined. The grano-diorite is evidently the younger and includes many masses of the amphibole rock in its magma. Beyond the brecciated zone the amphibole rock is quite uniform in texture and is found to consist largely of hornblende and feldspar, the latter usually subordinate. Quartz is also noticed in some specimens. The rock as a whole is hard and tough, and will no doubt make good macadam. This rock, most of which is massive and suitable for the purpose, extends 2,000′ along the bank of the canal and several hundred feet back from the river—practically an inexhaustible supply.

San Francisco County.

The quarrying of rock for macadam, concrete, rubble, ashlar, etc., in various parts of the City of San Francisco is continued uninterruptedly, and is an industry giving employment to a large number of men. Within the past two years, one of the principal quarries, the Blue Rock, has produced a quantity of handsome, dark-colored stone, which has been employed in the construction of buildings. This stone was largely used in the new lodge erected at the Oak Street entrance of Golden Gate Park.

Blue Rock Quarry.—See our XIIth Report, p. 389. It is on Douglas near Twenty-sixth Street, and is the only quarry in the county producing a stone suitable for ashlar. A large rock-face is now exposed, and an improvement in the quality of the stone is quite noticeable. Thirty men are employed. Gray Bros., of San Francisco, owners.

Crocker (Eureka) Quarry.—See our XIIth Report, p. 390. It is at the corner of Twentieth Street and Corbett Road. Red rock (jasper) is quarried here for concrete, macadam, etc. Twelve men are employed. Nathan Crocker, of San Francisco, owner.

Cushing & Wetmore Co.'s Quarry.—It is on the N.E. side of Telegraph Hill, on Lombard Street. Rock for macadam is the product of this quarry. Cushing & Wetmore Co., of San Francisco, owners.

Flint Tract Quarry.—See our XIIth Report, p. 390. It is at the corner of Tilden and South Broderick streets. Diggins Bros., of San Francisco, owners.

Park Quarry.—On the north side of Strawberry Hill, in Golden Gate Park, is a quarry from which rock is obtained for use on the Park driveways. It is worked as required.

Sherer (Wegscheider) Quarry.—See our XIIth Report, p. 390. It is on the Flint tract, on Sixteenth Street, between Douglas and Osborne. Red jasper for macadam and concrete is produced. Eleven men are employed. Joseph Sherer, of San Francisco, owner.

Spring Valley Water Co.'s Quarry.—It is ½ mile south of the west entrance of Golden Gate Park. It is worked to supply crushed rock as required by the company.

Telegraph Hill Quarry.—See our XIIth Report, p. 390. It is on the east side of Telegraph Hill, on Sansome Street. Rock for macadam, concrete, ballast, etc., is obtained here. Gray Bros., of San Francisco, owners.

Santa Clara County.

Porter's, W. R. (Gay), Quarry.—See our XIIth Report, p. 399. It is near Hillsdale, 3 miles S. of San José. Paving-blocks were formerly made, but recently a new stone-crusher, of 300 tons daily capacity, steam-engine, and boiler have been put up at the quarry, and only macadam is produced. The quarry is a conical-shaped cut, 200′ in diameter at the top and 60′ at the bottom. The rock is dark gray and hard in the bottom of the cut, but partially disintegrated nearer the surface. H. B. Burns, of San José, superintendent.

Shasta County.

Blue Limestone.—Excellent blue limestones are to be found in large bodies on Government land on Clear Creek, in the Horsetown District, 3 miles from Centerville; also on and near Bass ranch, on Stillwater Creek, though not as dark colored; likewise on Soda Creek, near Castella, in proximity to the railroad.

Solano County.

Benicia Rock-Crushing Co.'s Quarry.—See our XIIth Report, p. 390. It is on the S. P. R. R., 1 mile N. of Goodyear Station, at about 60′ elevation. The quarry is on the side of a low hill which is composed of rocks of volcanic origin, and said to contain considerable sulphur and iron. It is used for concrete and the macadamizing of roads, streets, etc., and is said to cement itself together into a hard, durable roadbed. Two crushers are employed; total capacity, 250 tons daily. It is worked intermittently, and 16 men are employed when it is operated. S. Johnson, of Benicia, secretary; J. H. Hoyt, of Benicia, superintendent.

Dickey's Quarry.—See Marble, Limestone, and Lime.

Thomason Quarry.—See our XIIth Report, p. 390. It is on an isolated, steep, basalt hill, 1 mile E. of Cordelia, at about 250′ elevation. The basalt exhibits a tendency toward columnar structure. The quarry consists of three large open cuts on the brow of the hill. The rock taken from them is lowered in cars on an incline, 530′ long, to the Gates crusher, of 200 tons daily capacity. Both macadam and paving-blocks are produced. Thirty-five men are employed. E. B. Thomason, of San Francisco, owner; G. L. Fry, of Cordelia, superintendent.

Sonoma County.

Petaluma Paving Co.'s Works.—See our XIIth Report, p. 390. They lie ½ mile S. of Petaluma. During 1895 the works have been idle most of the time; only 1,000 cu. yds. of rock was crushed. J. L. Hall, of Petaluma, superintendent.

MARBLE, LIMESTONE, LIME.

Amador County.

Carrara Marble Quarry.—See our VIIIth and XIIth Reports, pp. 104 and 391. It is 6½ miles N.E. of Jackson, on Sutter Creek. Not worked steadily.

Oleta Marble Quarry.—See our VIIIth and XIIth Reports, pp. 104 and 391. It is 3 miles S.W. of Oleta. It produces marble of good quality. Worked as the demand requires.

Calaveras County.

Caldwell Quarry.—See our XIIth Report, p. 391. It is 4 miles S.W. from North Branch. The marble is of fine quality and takes a high polish. The quarry is not worked regularly. Edward Caldwell, of Valley Springs, owner.

White, gray, and banded marble is found in many places in Calaveras County, but is not quarried. The belt passing through Tuolumne County extends northward through Calaveras, and is found near Vallecito, Murphy, and Cave City.

Contra Costa County.

Galindo Ranch.—An extensive deposit of light gray limestone occurs here, 3 miles S.E. of Concord. Lime was burned from it years ago. It is also suitable for macadam.

El Dorado County.

Bind & Co.'s Marble Quarry.—See our XIIth Report, p. 391. It is on Weber Creek, 4 miles E. of Diamond Springs and 5 miles S.E. of Placerville. Idle. E. Bind, of Placerville, owner.

Cave Valley Lime Co.—See our XIIth Report, p. 391. Its quarry is 5 miles S.E. from Auburn, Placer County. Idle. W. Davis and Henry Cowell, of San Francisco, owners.

Holmes Quarry.—It is at Alabaster Cave, at an elevation of 450′, and has one kiln of 14,000 lbs. capacity, employing 6 men. H. F. Holmes, of San Francisco, owner.

Swisler Quarry.—It is 5 miles S.E. of Placerville, with four old-fashioned kilns. Idle. Hon. C. A. Swisler, of Placerville, owner.

Fresno County.

A heavy ledge of blue limestone, suitable for lime, outcrops at Sampson Flat, on Kings River.

Near Dunlap a 30′ vein of calcite is found in the syenite, the best material for lime.

Inyo County.

Inyo Marble Co.—See our Xth and XIIth Reports, pp. 215 and 392. Its quarries lie on the western base of the Inyo range, between Keeler and Lone Pine. During 1895 the company shipped about $50,000 worth of marble. M. J. McDonald, Mills Building, San Francisco, president.

At the western base of the Inyo range, 6 miles E. of Big Pine, lies a bed of white rock made up almost entirely of the debris of shells. It covers an area of 3,000 acres, and is perhaps 10′ thick. It contains a trace of phosphoric acid, and may be of value as a fertilizer. M. D. Rocheford, of Big Pine, owner.

Kern County.

Metamorphosed limestone occurs in a number of places in the foothills 2 to 5 miles S. and S.E. of Tehachapi. It is suitable for making lime, but too much broken for building purposes.

Lee's, Thos., Quarry.—It is at the mouth of a cañon 3 miles S.W. of Tehachapi, at about 4,200′ altitude. The quarry is a small open cut, and the lime is burned in an ordinary "pot kiln" of 600 bbls. capacity per charge.

Seeger's, Henry, Quarry.—It is ½ mile S. of Lee's quarry, at 4,500′ altitude. Ordinary "pot kilns" are used, and it is worked irregularly.

Union Lime Co.'s Works.—They are in a narrow cañon, 3 miles S. of Tehachapi, at about 4,300′ altitude. Limestone is quarried from the vast bodies which outcrop on the sides of the cañon. Three patent continuous kilns are used, which have a total capacity of 150 bbls. daily, and about 35,000 bbls. are burned annually. Wood for fuel is abundant. Thirty men are employed. George W. North, of Los Angeles, secretary; Frank Weehan, of Tehachapi, superintendent.

Lake County.

Two occurrences of lime. See our XIIth Report, p. 392.

Los Angeles County.

Antelope Valley Marble Quarry.—It is situated in Antelope Valley, 40 miles N.E. of Lancaster. J. Rebman, of No. 317 Byrne Block, Los Angeles, secretary.

Madera County.

Marble suitable for structural use is found on the Chowchilla River, 3 miles N.E. of Grub Gulch. No quarries have been opened.

Mariposa County.

Marble of excellent quality and fine texture is found near the Hite Mine, in the cañon of the South Fork of Merced River. Undeveloped.

Mono County.

Blanchard & Davidson's Quarry.—It is 6 miles S.E. of Bodie, in Mono basin, at 7,250′ elevation. The ledge, 15′ to 30′ through, stands in high reefs. The egg-shaped kiln is 12′x16′ and has a capacity of 30 tons. Delivered in Bodie, it sells for $35 per ton and is largely used by the cyanide works. Blanchard & Davidson, of Bodie, owners.

Monterey County.

Nelson Creek.—See our XIIth Report, p. 392. Undeveloped.

Rockland Lime and Lumber Co.'s Quarry.—See our VIIIth and XIIth Reports, pp. 410 and 392. It is near the coast, between two branches of Mile Creek, 30 miles S.E. of Point Sur. The deposit is extensive, but too broken for building-stone. It is suitable for lime, macadam, etc. Four continuous kilns were erected several years ago. Idle. J. S. Hanley, of Alameda, manager.

Napa County.

A small quantity is made in Pope Valley. Two kilns are in constant use.

San Benito County.

Cienega Lime Co.'s Quarry.—See our VIIIth and XIIth Reports, pp. 488 and 393. It is on Cienega Creek, 13 miles S. of Tres Pinos, by road, at about 960′ altitude. The metamorphosed limestone occurs in a large mass on the north side of the creek, and in contact with granitic rocks. It varies from granular to wholly crystalline, and from white to gray. It is too much broken by joints to be valuable for building-stone, but is said to make first-class lime. The works consist of four patent continuous kilns of 50 bbls. daily capacity each. Seven quarrymen, 7 kilnmen, and 4 coopers are employed. The product is hauled to Tres Pinos for shipment. D. N. Tupper, of San José, manager; F. A. Enos, of Paicines, superintendent.

Granite Rock Co.'s Quarry.—It is in the northwest corner of the county and on the south side of Pajaro River, at about 200′ altitude. The rock is disintegrated on the surface into a finely divided material, used for top-dressing of roads, walks, etc., and the harder rock is crushed for macadam. The quarry is favorably situated both for handling and shipping the rock. The works are new, and consist of a steam-engine, boiler, crusher of 15 tons daily capacity, and rock-bins from which the rock passes to the railroad cars. Fourteen men are employed when running. H. S. Fletcher, of Watsonville, manager.

San Bernardino County.

Black Hawk Mountains, 30 miles E. of Victor, show white marble of excellent quality, but not worked.

California Portland Cement Works.—This company, whose plant is at Colton, manufactures, besides cement (q. v.), lime from the poorer class of limestone broken in the quarry. While it may be considered a by-product, the lime is of excellent quality, and it constitutes quite an important industry. California Portland Cement Works Co., of Los Angeles, owner; F. N. Spear, of Colton, superintendent.

Gem (*Kimball*) *Quarries.*—See our XIth and XIIth Reports, pp. 363 and 394. They are 14 miles N.E. of Victor. These quarries produce variegated marbles of great beauty, used largely in the interior decoration of buildings. G. W. Kimball, of National City, owner.

Oro Grande Lime Co.'s Quarries and Kilns.—The quarries are 1 mile E. of Oro Grande, and the kilns near the railroad. Idle. J. L. Morrow, of San Bernardino, superintendent.

Union Lime Co.'s Quarries and Kilns.—The quarries are ½ mile E. of Oro Grande, and the kilns at the railroad. Idle. T. Thomas, of Oro Grande, superintendent.

Santa Clara County.

Clark Ranch.—It is 7 miles E. of Madrone. An undeveloped deposit of limestone is said to occur on the ranch.

Guadaloupe Lime Co.'s Quarry.—See our VIIIth, Xth, and XIIth Reports, pp. 543, 619, and 394. It is on Guadaloupe Creek, 7 miles S.E. of Los Gatos. Idle.

Los Gatos Lime Co.'s Quarry.—See our VIIIth, Xth, and XIIth Reports, pp. 544, 619, and 394. It is on the side of a mountain 2½ miles S. of Los Gatos, at 700′ elevation, and the kiln is at Los Gatos. Idle. J. W. Taylor, of San Francisco, owner.

Santa Cruz County.

Extensive deposits of metamorphosed limestone lie, in more or less disconnected masses, on both sides of the belt of granitic rocks N.W. of Santa Cruz and W. of the San Lorenzo River, and are more extensively distributed on the southwestern side of the granitic rocks than on the northeastern. In places they are wholly crystalline, with the individual crystals unusually large. The rocks have been greatly broken by pressure and come out of the quarries in small angular blocks, for the most part too small for dimension stone for building purposes. A limited quantity has been quarried for curbing in Santa Cruz. Its use is principally for lime, although a considerable quantity is used by the sugar factories at Watsonville and Alvarado. It is also used for macadam and concrete work. Its colors vary from almost clear white to light blue and gray.

Henry Cowell Lime Co.'s (*Santa Cruz Lime Co.'s*) *Quarry.*—See our VIIIth and XIIth Reports, pp. 554 and 395. They lie in two groups, 1 and 2½ miles N.W. of Santa Cruz, at 300′ to 700′ elevation. There are three common kilns at each quarry, and it is stated that the production is from 2,500 to 3,000 bbls. of lime per week, during the summer. During the winter months they are usually idle. The rock is too coarsely crystalline to burn well in continuous kilns. It is carefully assorted before burning. The upper quarry is about 100′x 200′, and 75′ deep at the face. The strata dip 30° N.W., are somewhat metamorphosed, and considerably broken by pressure. The lower quarry consists of a number of cuts on the outcrop along a ravine, which is channeled through the deposit. The rock is in part coarsely crystalline and in part granular or amorphic. The superintendent stated that during the summer of 1895 they employed 20 men in the quarries, 25 at and around the kilns, 12 coopers, 30 woodchoppers, and 50 teamsters. The Henry Cowell Lime Co., of San Francisco, owner; E. V. Cowell, of Santa Cruz, superintendent.

I X L Lime Co.'s Quarry.—See our VIIIth and XIIth Reports, pp. 555 and 395. The quarries and kilns are 1½ miles N.W. from Felton, at about 800′ altitude. They are worked by two open cuts in outcrops of massive gray limestone, which is much broken. There are three kilns, whose production is about 35 bbls. per month. Nine cords of wood are required to burn 100 bbls. of lime, and the stone loses 45% to 55% in weight by burning. About 40 men are employed during the summer, divided as follows: 20 in the quarries and at the kilns, 4 coopers, 4 stave-makers, 2 teamsters, 2 roustabouts, and 8 to 10 woodchoppers. Blackman & Cerf, of San Francisco, owners; Baruch Cerf, of Felton, superintendent.

Louis de Dero Quarry.—See our XIIth Report, p. 395. It lies about 11 miles N.W. from Santa Cruz, at about 250′ altitude. It is worked by an open cut, about 250′ long, and 30′ to 40′ deep. The rock is a gray limestone, heavily beaded and considerably broken, and dips 20° N.W. It is principally used for macadam and concrete, and a limited quantity for street-curbing, etc. Between 3,000 and 4,000 tons were sold in 1895. From 5 to 20 men are employed, depending upon the demand for the rock. W. E. Miller, of Santa Cruz, superintendent.

Thurber Quarry.—It is about 900′ S. of the De Dero quarry and at almost the same elevation. It is worked by a large, irregular, shallow cut. The rock is light gray in color and varies in structure from coarsely crystalline to granular. Sold principally to the sugar factories. About 6,000 tons were sold in 1895. Fifteen men were employed for about four months in that summer. T. J. Thurber, of Santa Cruz, owner; H. Sweeney, superintendent.

The W. T. Holmes Lime Co.'s Quarry.—See our VIIIth, Xth, and XIIth Reports, pp. 554, 626, and 395. It is located about ½ mile N. of Felton, at about 1,200′ elevation. There are two kilns at the quarry and seven at Felton. The quarry is on the steep side of a hill and its face is from 100′ to 300′ high. The limestone is much disturbed, broken, and metamorphosed to some extent. It lies adjacent to the granitic rocks which are prevalent in that locality. All that is suitable is burned into lime, and no building-stone or macadam is produced. From 30 to 50 men are engaged in and around the quarry and works in summer. Wood for fuel is cheap. E. W. Hawkins, of No. 22 Sacramento Street, San Francisco, secretary; William Russel, superintendent.

Shasta County.

Holt & Gregg's Quarry.—It is 3 miles S. of Kennett, and comprises three quarter-sections of land with stone of fine quality, carrying 97% carbonate of lime, 2% magnesia, and 1% silica, making a very pure limestone. One kiln of 30 tons capacity is on the property, which is not worked continuously; 3,000 bbls. were burned last season. Two men are employed. Holt & Gregg, of Red Bluff, Tehama County, owners.

McCloud River.—Cliffs of lime almost 1 mile wide are between Squaw Creek and Pitt River, bearing N.W. up the McCloud River.

Siskiyou County.

Etna.—A large deposit of marble is found 3 miles W. of Etna, on the road to Sawyer's Bar. It is exposed in a cut made for the wagon-road, and seems to be about 800′ thick. In color it varies; some strata are white; others mottled or veined with red, green, or black; and still others are black and green, or black and red. With cheap transportation facilities it will become valuable.

Oak Bar.—Cloudy marble crops above the town of Oak Bar, on Klamath River.

On Thompson Creek, 10 miles above Happy Camp and 2 miles from the Klamath River, occurs a large bed of valuable marble. The stone is hard and takes a good polish. The crystals are large, white, and translucent mixed, which gives a pretty combination. John C. Wood, of Seiad, owner.

Solano County.

Dickey's, A. A., Quarry.—See our Xth and XIIth Reports, pp. 670 and 395. It is on the west side of a hill, on A. A. Dickey's ranch, 4 miles E. of Suisun, at about 375′ elevation. The marble or metamorphosed limestone is of a massive nature and so broken into angular blocks that renders it unsuitable for building-stone. The greater part of it is used for flux in the Selby smelting works at Vallejo Junction, and the remainder crushed for macadam and concrete. It is worked only during the summer. Nine men are employed.

Sonoma County.

Limestone is found near Geyserville; see our XIIth Report, p. 396.

Trinity County.

A strong bed of gray marble crops out across the North Fork of Trinity River near the mouth of East Fork. A short distance above Taylor Flat a ledge of marble crosses Trinity River.

Tulare County.

On the road to South Tule Indian Reservation, 8 miles S.E. of Porterville, a dark gray marble suitable for building purposes is found. Robert James, of Porterville, owner.

At *Three Rivers*, 25 miles E. of Visalia, a blue-black marble occurs, which is suitable for lime and for building-stone.

Tuolumne County.

Columbia Marble Quarries.—See our XIth and XIIth Reports, pp. 506 and 396. They are 2½ miles N. of Columbia, and have been worked continuously during the past two years; mostly on orders for local market. The marble—white, gray, banded, and rose-mottled—is remarkable for its evenness of grain and its elasticity. Sheets of considerable area have been sawed not more than $\frac{1}{16}$″ in thickness. Its enduring qualities are well shown in the marble sidewalk laid in 1878 around the Palace Hotel in San Francisco, the material of which came from these quarries. Six men are employed. Columbia Marble Quarry Co., of San Francisco, owner; W. D. Bannister, of Columbia, superintendent.

A broad belt of *limestone*, with occasional spots of good marble, extends through this county in a northwesterly direction, passing W. of Buchanan, E. of Sonora, and through Columbia. It has been opened at numerous places, but none of these quarries, except those near Columbia, are worked. The Stanislaus Cañon is cut down 1,000′ through this belt, which is about 3,000′ wide.

PAVING-BLOCKS.

Marin County.

Gallagher Quarry.—It is 3 miles N. of Novato, and produced during 1895, 125,000 blocks. J. Gallagher, of Novato, owner.

A score or more of quarries exist, but on account of the decreased demand are idle. See our XIIth Report, p. 396.

Napa County.

Olsen Quarry.—It is 2 miles N.E. of Napa, and consists of a dark trachyte, similar to that in Sonoma County. Five hundred blocks are made per day and shipped by boat to San Francisco. Capt. J. Olsen, of Napa, owner.

Solano County.

McNaughten's, A., Quarry.—It is on an isolated hill 1¼ miles N.E. of Cordelia. Basalt has been quarried from a number of small cuts and made into paving-blocks. Idle.

Thomason Quarry.—See Macadam. It is 1 mile E. of Cordelia. Both paving-blocks and macadam are produced. E. B. Thomason, of San Francisco, owner.

Sonoma County.

The demand for paving-blocks is decreasing from year to year, owing to the introduction of asphalt and bituminous-rock pavement. Of the 2,332,000 paving-blocks produced in California in 1895 and used in San Francisco, Oakland, Sacramento, Stockton, and San José, 2,136,000 were furnished by Sonoma County.

Barnes Quarry.—See our XIIth Report, p. 396. It is 2 miles E. of Penn's Grove. The product for 1895 is about 20,000 blocks. A. Barnes, of Penn's Grove, owner.

Boca Quarry.—See our XIIth Report, p. 396. This is 1½ miles E. of Glen Ellen. During 1895, 8,000 blocks were shipped. Boca Bros., of Glen Ellen, owners.

Borg Quarry.—See our XIIth Report, p. 396. Located near Melitta. Idle since 1894.

Clute Quarry.—See our XIIth Report, p. 396. This is near Santa Rosa. In 1895, 70,000 blocks were made. A. B. Clute, of San Francisco, owner.

Cooney Quarry.—See our XIIth Report, p. 397. It lies 5 miles N.E. of Petaluma, and has been idle most of 1895. P. Cooney, of Petaluma, owner.

Cronin Quarry.—See our XIIth Report, p. 397. It is 1½ miles S. of Petaluma. During 1895, 70,000 blocks were made. P. Cronin, of Petaluma, owner.

Davis Quarry.—See our XIIth Report, p. 397. This is 2 miles E. of Penn's Grove. The product for 1895 was 25,000 blocks. E. W. Davis, of Penn's Grove, owner.

Dickinson Quarry.—See our XIIth Report, p. 397. It is 7 miles N.E. of Petaluma. Only 10,000 blocks were made during 1895. D. S. Dickinson, of Petaluma, owner.

Elliott Quarry.—This is near Santa Rosa; 325,000 blocks were made in 1895. McD. Elliott, of Santa Rosa, owner.

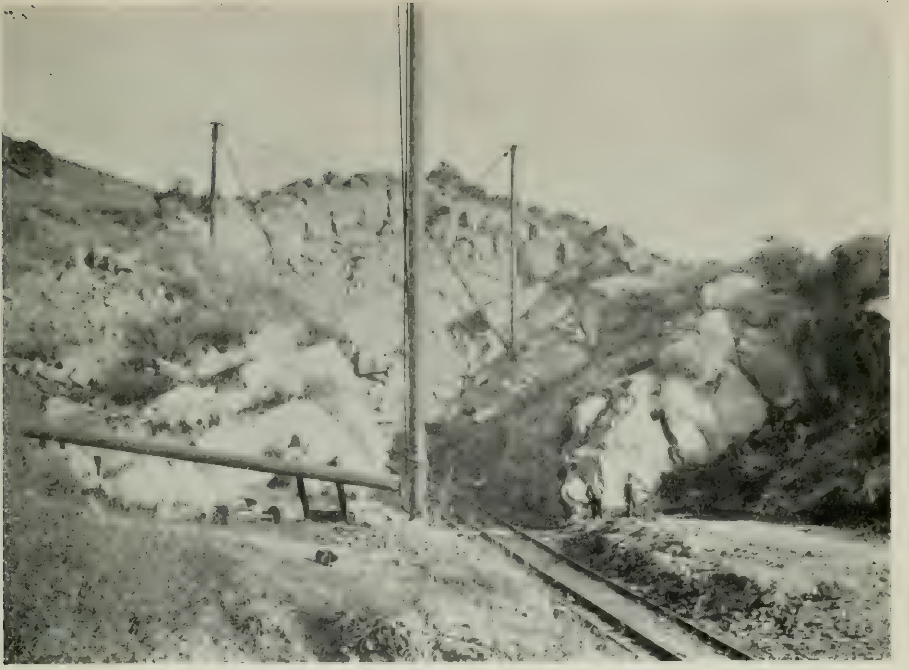
Harding Quarry.—It lies 5 miles N.E. of Petaluma. The product for 1895 was 85,000 blocks. Lester Harding, of Petaluma, owner.

Harney Quarry.—See our XIIth Report, p. 397. This is near Melitta. During 1895, 60,000 blocks were made. W. Harney, of Santa Rosa, owner.

Landgren Quarry.—See our XIIth Report, p. 397. In 1895, 20,000 blocks were made. Fred Landgren, of Santa Rosa, owner.

Lynch Quarry.—This is 6 miles E. of Petaluma. The product for 1895 was 70,000 blocks. John Lynch, of Petaluma, owner.

Manuel Quarry.—See our XIIth Report, p. 397. It is at Kenwood Station. In 1895 it produced 1,000,000 blocks. A. Manuel, of Kenwood, owner.



Goodrich Sandstone Quarry, Santa Clara County.

Sites Sandstone Quarry, Colusa County.

Maramora Quarry.—See our XIIth Report, p. 397. It is at Kenwood, and 70,000 blocks were made in 1895. P. Maramora, of Kenwood, owner.

Maroni Quarry.—See our XIIth Report, p. 397. It is located at Kenwood. Idle.

McDonald Quarry.—This lies 3 miles E. of Santa Rosa. The product for 1895 was 175,000 blocks. M. J. McDonald, of Santa Rosa, owner.

Pinelli Quarry.—This lies 3 miles E. of Santa Rosa. The product for 1895 was 75,000 blocks. V. Pinelli, of Santa Rosa, owner.

Pinelli Quarry.—See our XIIth Report, p. 397. It is 1 mile W. of Sonoma. During 1895, 25,000 blocks were made. V. Pinelli, of Santa Rosa, owner.

Roberts Quarry.—See our XIIth Report, p. 397. It lies 2 miles E. of Penn's Grove. Forty thousand blocks were made in 1895. L. Roberts, of Penn's Grove, owner.

Schocken Quarry.—See our XIIth Report, p. 397. It is situated at Sonoma, and produced 200,000 blocks in 1895. G. W. Schocken, of Sonoma, owner.

Stacy Quarry.—See our XIIth Report, p. 397. It lies at Kenwood. Idle.

Thomason Quarry.—See our XIIth Report, p. 397. This is near Melitta. Idle.

Violette Quarry.—See our XIIth Report, p. 397. Situated near Melitta. During 1895, 100,000 blocks were made. G. Violette, of Melitta, owner.

Weyl Quarry.—See our XIIth Report, p. 397. It is at Sonoma. Idle.

Wilkinson Quarry.—See our XIIth Report, p. 397. This lies at Penn's Grove. Idle.

SANDSTONE.

Alameda County.

Farwell's Quarry.—See our VIIIth and XIIth Reports, pp. 35 and 388. It is in a cañon tributary to Niles Cañon, 1½ miles N. of the S. P. R. R. The rock is sandstone and is used for building purposes, etc. Idle. William Farwell, of Berkeley, owner.

Colusa County.

Sites (*O'Neil & Abbot*) *Quarry.*—See our XIth and XIIth Reports, pp. 188 and 398. It is on the Colusa and Lake Railroad, about ¾ of a mile E. of Sites, at about 400′ elevation. It is a compact sandstone, in layers 8′ to 10′ thick, dips 45° to 55° N.E., and is comparatively easily worked. The plant consists of a Sargent and an Ingersoll drill, a steam channeler, two gang-saws, three derricks, etc., and is run by steam. Idle. Sites Sandstone Co., of No. 315 Montgomery Street, San Francisco, owner; J. N. Burns, of Sites, superintendent.

Contra Costa County.

The hills about Martinez contain sandstone, which has been quarried to some extent for building purposes some years ago, but for the most part it is too soft to withstand the pressure of large buildings. That on the ranch of James Rankin, near Martinez, is said to be better if properly selected. Sandstone for road material has been taken from outcrops on C. Baumgarten's ranch, 1½ miles S. of Martinez; from C. W. Rehnert's ranch, 2 miles E. of Martinez, and from the ranches of Avery and Burdell, near Pacheco. Hard blue sandstone and arenaceous shale also occur on the Rehnert place, 4 miles S. of Martinez, which may be used on roads if properly selected and crushed. See our XIIth Report, p. 398.

Del Norte County.

Edwards' Quarry.—It is situated 2 miles E. of Crescent City. The rock is a hard, gray and brown metamorphic sandstone, and is of a superior quality. It is used in the vicinity only. — Edwards, of Crescent City, owner.

Humboldt County.

Hard, gray metamorphic sandstone crops out for a long distance on the road north and south of Trinidad, and is valuable for building purposes.

Jacoby Creek Quarry.—See our XIIth Report, p. 399. It lies on Jacoby Creek, 12 miles N.E. of Eureka, and is the largest quarry in the State. The rock is being used for a breakwater at the mouth of Humboldt Bay. During the year 1895 about 210,000 tons of rock were shipped, a large part of which was in blocks weighing several tons. There are nine large derricks, and a smaller (iron) one mounted on a movable car. The rock is loaded on cars of about 10 tons capacity, hauled by locomotives to the pier, and pushed upon large barges, which are towed by a tug-boat to the jetties, where the cars are dumped. One hundred and seventy-five men are employed. They receive 20 cents per hour and are charged 50 cents per day for board. Flannigan, Brawser & Co., of Eureka, owners.

Mendocino County.

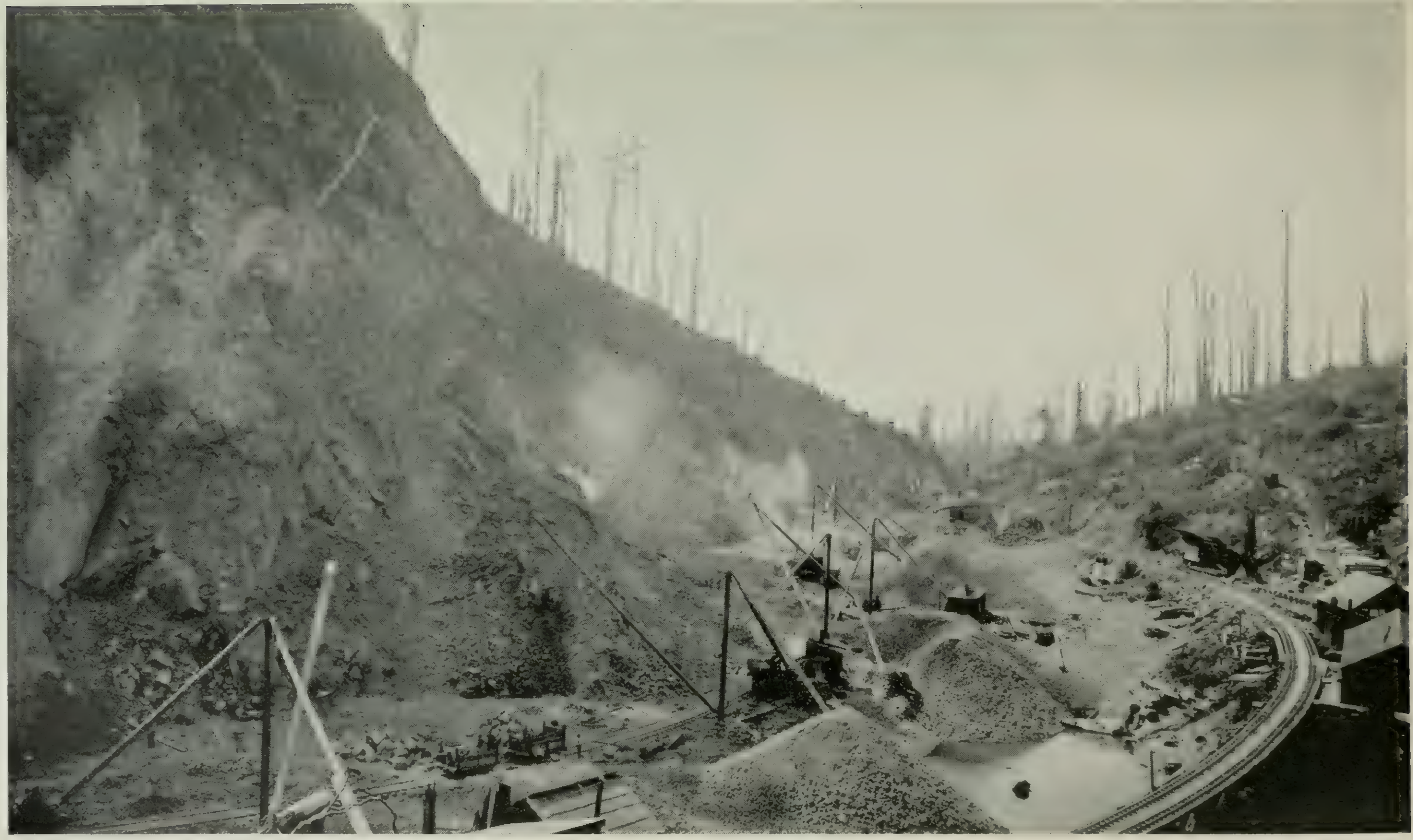
A heavy ledge of yellow-gray sandstone of excellent quality crops out on the headwaters of Orr's Creek, 6 miles W. of Ukiah, and also on Robert's Creek, 5 miles S.W. of Ukiah. Unimproved.

Monterey County.

Tassajara.—A gray and olive-colored sandstone, suitable for building purposes, occurs in large quantities near Tassajara Springs. It overlies the crystalline schists, dips 30° to 45° E., is soft enough to be easily worked, and is said to harden by exposure. The hotel at the springs is built of this stone. It is too far from railroad to be commercially valuable.

Napa County.

Gardner Quarry.—It lies in Wooden Valley, 10 miles E. of Napa, and is only worked occasionally. The rock is a soft gray sandstone. George Gardner, of Napa, owner.



Jacoby Sandstone Quarry.

San Luis Obispo County.

Moor's Quarry.—It is near the P. C. R. R., in Los Berros Valley, about 5 miles S. of Arroyo Grande, at about 300′ altitude. The rock is a fine, light-colored sandstone, rather soft, but said to harden by exposure, and is a massive, almost horizontal bed, suitable for rough wall, foundations, etc. Idle. P. Moor, of Arroyo Grande, owner.

Santa Barbara County.

Erickson Quarry.—It is on the S. P. R. R., 8 miles S.W. of Santa Maria, at about 300′ altitude. It is a rough gray sandstone, in strata 20″ to 25″ thick, and dips 45° E. It is suitable for rough masonry and is used principally in railroad work. J. B. Erellanas, of Santa Maria, owner.

Undeveloped Deposits.—A vast deposit of gray sandstone, suitable for building purposes, is in the Santa Ynez Mountains. It outcrops near Cold Spring Station, on the stage road, and extends many miles, principally in massive strata, and dips at various angles.

Santa Clara County.

Flynn Quarry.—See our XIIth Report, p. 399. It is on the Searles estate, 2½ miles S. of Hillsdale. A large quantity of gray, massive sandstone is exposed, and a small quantity has been quarried. Idle.

Gay Quarry.—See Macadam.

Goodrich Estate (Greystone) Quarry.—See our VIIIth, Xth, and XIIth Reports, pp. 546, 618, and 399. It is ½ mile E. of Greystone Station, 10 miles S. of San José. The rock is colored gray and brown, easily worked, and dips 20° N.E. It is extensively used for public buildings. The works consist of two gangs of saws, a cutting and finishing department, and are at Greystone Station. There are three derricks at the quarry and three at the works. Ten men are employed in the quarry, and fifteen at the works, in summer. J. Pfeiffer, of San José, superintendent.

Stanford Quarry.—See our VIIIth, XIth, and XIIth Reports, pp. 547, 618, and 399. It is on the Goodrich estate, at Greystone Station. The rock is similar to that of Goodrich estate quarry, and the buildings at the Stanford University are made of it. Idle.

Shasta County.

California Sandstone and Construction Co.'s Quarry.—It is situated on Clear Creek, 3 miles from Girvin's switch or Bell's Ridge, at about 450′ elevation, and comprises 13 acres. The stone is massive, fine-grained, dove-colored, and hardens on exposure. The pit has just been opened; its dimensions in 1895 were 16′x 50′x 7′. The company use two steam 10 H.P. derricks—one at the quarry of 15 tons capacity, 40′ mast, 61′ boom, and a similar one at the railroad switch, 3 miles distant. One Ingersoll channel-bar cutter, for making an 8′ cut, is employed. The present output amounts to one carload (250 cu. ft.) per week. Thirteen men are employed—5 stonecutters, 5 laborers, and 3 on machines. California Sandstone and Construction Co., of No. 16 Post Street, San Francisco, owner; J. C. Moffit, of Redding, manager.

Sand Flat Quarry.—It is 6 miles N.E. of Redding, and is not of a good quality; the sandstone contains salt. Idle.

Stillwater Quarry.—It is on Stillwater Creek. Idle.

Sonoma County.

Good sandstone, suitable for large buildings, is found at Fort Ross. See our XIIth Report, p. 400.

Ventura County.

The Sespe brownstone occupies a prominent place among our structural materials. It is a stone of great tensile strength, varying in color from gray to brown and almost black; in some ledges it is fine-grained, while in others coarse-grained. The hard Eocene sandstone, of which it is an important member, can be traced eastward from the Santa Ynez Mountains to the Devil's Gate and the Sespe oil and brownstone districts. In the Devil's Gate District, stone claims have been located which will afford an immense supply of building material when a railroad shall have been built thereto; and in the Sespe District the following quarries have been opened:

Phœnix Sandstone Quarry.—It is partly in Sec. 6, T. 4 N., R. 19 W., and partly in Sec. 1, T. 4 N., R. 20 W., S. B. B. and M., and is 3½ miles N. of Brownstone Spur. The sandstone strata are 8′ to 12′ thick and dip 75° S. The output in 1895 was 3,000 cu. ft.; price f. o. b. at Brownstone Spur, 50 cents per cubic foot for rough stone, and dressed stone according to contract. Six men are employed. Henley Bros., of Sespe, owners.

Razzle Dazzle Sandstone Quarry.—It is about 3½ miles N. of Brownstone Spur, on the S. P. R. R. During 1895 work was suspended at this quarry, but the owners quarried loose blocks of stone on land adjoining. Fifteen men are employed. Mentone Sandstone Co., owner; D. Kilpatrick, of Sespe, superintendent.

Mentone Sandstone Works.—They are at Brownstone Spur. The plant consists of two gang-saws, one rubbing-bed, and one stone-cutting machine, all run by steam-power. The output during 1895 was 8,400 cu. ft. of dressed and 4,800 cu. ft. of rough-hewn stone. Eighteen men are employed. Mentone Brownstone Co., owner; D. Kilpatrick, superintendent.

Yolo County.

Putah Creek Quarry.—See our Xth Report, p. 791. It is on the north side of Putah Creek, at "Devil's Gate," in the southwest corner of the county, at about 200′ elevation. The rock is gray and olive-colored sandstone, principally in massive strata, which dip 65° to 70° N.E., and forms a high ridge through which the creek has cut its channel. It has been used to some extent for building purposes and cemetery work. Idle. E. F. Searles, of San Francisco, owner; B. Bertholet, of Winters, superintendent.

SLATE.

El Dorado County.

Chili Bar Slate Quarry.—See our VIIIth, IXth, and XIIth Reports, pp. 199, 283, and 400. It is 3 miles N. of Placerville. Eight men are at work. An incorporated company, owner; J. Ruschetti, of Placerville, manager.

El Dorado Big Tunnel Co.—See our XIIth Report, p. 401. Gentle Annie Mining Co., of Placerville, owner.

San Francisco Slate Co.—See our XIIth Report, p. 401. Its quarry is on the north side of the American River, 3 miles N. of Placerville. Idle. San Francisco Slate Co., owner; J. R. S. Kymersley, of San Francisco, president.

Strahle Quarry.—See our VIIIth and IXth Reports, pp. 199 and 283. It is about 1 mile S. of Kelsey, and is well opened. Worked intermittently. Jacob Strahle, of San Francisco, owner.

STEATITE AND SERPENTINE.

El Dorado County.

Darlington Quarry.—This deposit, from 50′ to 60′ wide, was formerly quarried, and is about 3 miles S.E. of Placerville. Idle. A. Darlington, of Placerville, owner.

Los Angeles County.

Banning Serpentine Quarry.—It is situated on Catalina Island. The output is principally for ornamental, sanitary, and electrical uses. Eighty men are employed. Banning & Co., of No. 222 S. Spring Street, Los Angeles, owners.

Empire Landing Quarries.—On Catalina Island. See our XIIth Report, p. 402.

Napa County.

In Chiles Valley, soft, greenish soapstone occurs in seams, 4″ thick, in the serpentine.

Riverside County.

Several veins of white, scaly talc have been discovered 3 miles S.W. of Winchester, and some superficial work done. The mineral seems of good quality. F. A. Stephens, of Menifee, owner.

TRACHYTE, TUFA, ETC.

Napa County.

Howell Mountain Quarry.—It is at Glendale, 3 miles S. of St. Helena. The rock is a red and white trachyte, hard enough to be used for large structures, and weighs 140 lbs. per cubic foot. No regular quarry face has been made, being worked only occasionally. The product for 1895 was about 15,000 cu. ft. E. T. Hill, of St. Helena, owner.

Manuel Quarry.—This lies back of the asylum, 2 miles S. of Napa. The rock is a very hard, gray trachyte. The quarry is worked only occasionally. A. Manuel, of Napa, owner.

Newman Quarry.—This lies on the Berryessa road, 4 miles N.E. of Napa. The rock is a fine-grained, hard, gray trachyte, and is used for ashlar and first-class masonry; 400 tons of cut stone were produced during 1895. Newman & Wing, of Napa, owners.

Rose Quarry.—It is 1½ miles E. of Calistoga. The rock is a soft, trachyte tufa, and is used in and near Calistoga for low buildings; is too soft for larger structures. David Rose, of Calistoga, owner.

Salmina Quarry.—It is 7 miles E. of Napa. The rock is a soft tufa, and the quarry is worked only occasionally. Frank Salmina, of Napa, owner.

Sonoma County.

Several localities are mentioned in our XIIth Report, p. 404, where tufa is quarried occasionally. The rock in Sonoma County is too soft, and not a desirable building-stone.

Yolo County.

Sackett Bros.' Quarry.—See our Xth Report, p. 791. A whitish volcanic rock has been quarried for building purposes, on Sackett Bros.' land, 5 miles W. of Winters. It occurs in vast quantities, overlying a heavy bed of conglomerate, and is a soft, crumbly rock in places, but hardens to some extent upon exposure. It has been used for rough masonry at Winters.

TRAVERTINE AND ONYX.

Mendocino County.

Aragonite (California Onyx).—It is reported that a large deposit of this mineral has been found in Gravelly Valley.

Mono County.

The *Travertine Quarry*, situated 1 mile S.E. of Bridgeport, has been further prospected since our last Report (see page 403), and the south ledge proved to be 30′ deep. Two new springs, with a flow of 5,000 gals. in twenty-four hours, have appeared in the quarry; the water of one is cool, while that of the other is 90° F. This stone is meeting with much favor for inside and outside work. California Travertine and Onyx Co., of San Francisco, owner; H. Mathey, of Bridgeport, manager.

San Luis Obispo County.

Kesseler's Quarry.—See our Xth Report, p. 584. It is in Secs. 9 and 16, T. 31 S., R. 15 E., 16 miles N.E. of Arroyo Grande, at about 1,800′ altitude. The property consists of 925 acres of patented land, on which are two outcrops of so-called oynx (aragonite), about ½ mile apart. One is milk-white and the other, now worked, is more variegated; it occurs in layers up to 22″ in thickness, which dip 70° E. The quantity of available material has not been definitely ascertained. It is sawed by hand at the quarry intó 5′x 6′ blocks, hauled to Arroyo Grande, and shipped by rail to San Francisco, where it is principally used for ornamental purposes. Four men are employed. Frank Kesseler, of San Francisco, manager.

The following analysis by R. L. Packard is from the Report of the U. S. National Museum for 1893, face p. 558:

Calcium carbonate ($CaCO_3$)	93.86
Magnesium carbonate ($MgCO_3$)	1.43
Iron carbonate ($FeCO_3$)	3.93
Manganese carbonate ($MnCO_3$)	0.06
Tricalcic phosphate ($Ca_3\,[PO_4]_2$)	0.25
Total	99.53

Sonoma County.

Gray-Madeira Onyx Mine.—It was discovered in the fall of 1895, and is situated at the head of Gillam Creek, a tributary of Austin Creek, 16 miles W. of Healdsburg, at 1,560′ altitude. The aragonite found here is green. It has filled a number of parallel fissures in a belt of serpentine, which courses N.W. and dips 70° W. The mineral incloses masses of magnesite and soft, decomposed serpentine. Some specimens show cavities lined with milky chalcedony; others have their seams of chalcedony between the crystals of aragonite, so as to give it a banded structure. The inclosing silicified serpentine is most beautifully veined with yellow and brown opal, chalcedony, and jasper. It is very hard; and can be had in large blocks, making it a valuable material for table-tops and mantels. The locality is in the site of an ancient hot spring, now dried up. The geologic formation leads to the assumption that cinnabar may be found there. George Madeira et al., of Healdsburg, owners.

Yolo County.

Tolenas Springs Deposit.—See our Xth and XIIth Reports, pp. 668 and 403. A deposit of so-called onyx (aragonite) exists at Tolenas Springs, 5 miles N. of Suisun, at about 1,000′ elevation. It is principally white and gray colored, occurs in layers of various thickness from 3″ upward, and of uncertain extent. It was formerly quarried to some extent for ornamental purposes. The following analysis of a sample from this deposit, by R. L. Packard, is from the Report of the U. S. National Museum for 1895:

Calcium carbonate ($CaCO_3$)	95.48
Magnesium carbonate ($MgCO_3$)	2.20
Strontium carbonate ($SrCO_3$)	1.59
Barium carbonate ($BaCO_3$)	0.11
Water (H_2O)	0.37
Total	99.75

Tolenas Springs and Onyx Co., owner; W. H. Chittenden, of Suisun, superintendent.

MISCELLANEOUS.

ASBESTOS.

Riverside County.

Several vein-like deposits of asbestos have been found 3 miles S.E. of Winchester, on which some surface cuts have been made. The mineral seems of fair quality. F. A. Stephens, of Menifee, owner.

CHRYSOPRASE.

Tulare County.

This valuable mineral occurs in seams in a ferruginous, silicious rock, found on Secs. 5 and 8, T. 18 S., R. 26 E. About $550 worth of rough stone has been sold so far this year.

DIAMONDS.

El Dorado County.

Diamonds have recently been found on Perry Creek, and also several at Smith's Flat, 2 miles E. of Placerville.

FRENCH CHALK.

Los Angeles County.

Banning Quarry, on Catalina Island; output for 1895, 10,000 lbs. Price, $15 per ton. Banning & Co., of No. 222 S. Spring Street, Los Angeles, owner.

GRAPHITE.

Fresno County.

A large body of graphite is found in Drum Valley, 6 miles N. of Auckland, Tulare County, on the land of William Kincaid, of Dunlap, and another body on the Reeves ranch, 3½ miles W. of Dunlap.

MINERAL PAINT WORKS, NEAR HEALDSBURG.

CALIFORNIA ONYX, NEAR HEALDSBURG.

INFUSORIAL EARTH.

Los Angeles County.

There is a quarry of infusorial earth on Catalina Island. The output in 1895–96 was 10,000 lbs. Price, $60 per ton. Banning & Co., of No. 222 S. Spring Street, Los Angeles, owner.

MINERAL PAINT.

Sonoma County.

Indian Metallic Red Paint Mine.—See our XIIth Report, p. 406. It lies 7½ miles S.W. of Healdsburg, on Porter Creek. The rock, as it comes from the tunnel, is a very silicious hematite. After a superficial sorting it is crushed and passes to an iron drying drum (heated by a wood fire), which revolves at a slight inclination; thence to the self-feeders of an ordinary 10-stamp mill; thence the dry pulp passes through a coarse bolting-cloth, and the residue (particles of quartz) is thrown away. That which passes through the bolting-cloth is ground between three sets of French burr-stones, and between each set is passed through the finest bolting-cloth. Finally it is passed between iron rollers, one running faster than the other, to give a sliding action, and packed in paper-lined barrels of 300 lbs. each. For a darker grade the ore is mixed in the stamps with a black carbonaceous shale, obtained near the mill. The product for 1895 was about 100 tons. T. S. Merchant et al., of Healdsburg, owners.

Paint Mine.—It lies 5 miles N.E. of Cazadero. The location is made on a vein, 200′ wide, of very impure silicious hematite.

Brown's Ochre Mine.—This is 2½ miles N. of Occidental. The ochre is a soft volcanic ash of light yellow color, containing little silica. Idle. William Brown, of Occidental, owner.

PLATINUM.

Del Norte County.

Platinum is found in the beach sands. In the Crescent City Beach Mine ¼ oz. was saved per day. It is also found in the auriferous sands of Smith River, 4 miles E. of Crescent City.

Humboldt County.

Platinum is found in paying quantities in the beach sands along the coast. In the Union Mine the gold contains about 5%, and in the Little River Mine about 50%.

Plumas County.

See our XIIth Report, p. 408. Some of the auriferous gravels in hydraulic mines have been found to contain scales of platinum and allied metals, especially along Spanish Creek, and at La Porte.

Trinity County.

This metal is found in all the tributaries of New River, but particularly in Devil's Cañon Creek. It also occurs in the North and East forks of Trinity River, and on French Creek near Taylor Flat; on the latter stream the metal is taken out in rather large quantities, and it is said that nuggets are sometimes found attached to ore inclosed in "a dark-colored rock." On the second bench of the main Trinity River it is found most abundantly, occurring in some parts in nuggets up to 1 oz. in weight.

SALT.

Alameda County.

The recovery of salt from the waters of San Francisco Bay by evaporation, in the marshes about Newark, Alvarado, Mount Eden, and Russels, has become an important source of revenue and one of the leading industries of the county. The output per annum is now many thousand tons, and 300 men or more are employed during the busy season of spring and summer. Recovering salt from the waters is accomplished by allowing the waters during high tide to enter the large vats, surrounded by levees, and the gates are then closed. As evaporation progresses the water is drawn from one vat to another until the liquor becomes so concentrated that the salt crystallizes out of it. The coarsely crystalline salt thus obtained is dried and ground to various degrees of fineness, to suit the purposes desired. Coarse salt is sold to packing-houses, chlorination works, etc., while that used for table purposes is further dried and ground to a much greater degree of fineness. See our VIIIth and XIIth Reports, pp. 30 and 408.

Barton's Works.—They are 4 miles W. of Alvarado. Formerly the salt was shipped to San Francisco to be ground and prepared for market. Recently a large warehouse has been erected at the vats, and a mill will be erected, in order that the salt may there be ground and prepared for market. About 500 tons were produced in 1895, and 24 men were employed. B. R. Barton, of No. 213 Sacramento Street, San Francisco, manager; G. W. Sylvester, of Alvarado, superintendent.

Baumberger's, J., Works.—They are about 2½ miles S.W. of Mount Eden. About 350 tons are produced annually, and 10 men are employed when the works are operated.

Carbon Island Salt Co.'s Works.—They are near the bay, 4 miles E. of Alvarado. Eight to ten thousand tons are said to be produced annually. From 40 to 50 men are employed in summer, and from 15 to 20 in winter. P. Peterson, of Alvarado, superintendent.

Cox's, A., Works.—They are 2 miles S.W. of Mount Eden. Eighty acres are under levee. Two men are employed.

Crystal Salt Co.'s Works.—This company produces salt 1½ miles S. of Alvarado, and also near Newark. Twelve men are employed at Alvarado, and 8 at the Newark works. Plummer Bros., of No. 14 Spear Street, San Francisco, owners.

Marsicano's, P., Works.—They are 2 miles W. of Mount Eden. About 12,000 tons are said to be produced annually. It is shipped to San

Francisco and there ground and prepared for market. From 40 to 50 men are employed in summer.

Mathewson's, P., Works.—They are near Russel's Station. Only a small quantity is produced.

Matson's, C., Works.—They are near Russel's Station. Only a small quantity is produced.

Micleson's, Mrs. M., Works.—They are 2½ miles W. of Mount Eden. About 4,000 tons are said to be produced annually. Twelve men are employed in summer.

Oliver's, Mrs. E. A., Works.—They are 2 miles S.W. of Mount Eden. One hundred and sixty acres are under levee, and the mill is located at the vats. Twelve men are employed. Oliver Bros., of Mount Eden, managers.

Pestdolf's, C., Works.—They are 1¼ miles W. of Russel's Station. Only a limited quantity is produced.

Pestdolf's, D., Works.—They are 1½ miles W. of Russel's Station. Only a limited quantity is produced.

Quigley's, J., Works.—They are 1½ miles W. of Alvarado. Three thousand tons are produced annually. Twelve men are employed in summer. E. M. Foley, of Alvarado, superintendent.

Sinclair's Works.—They are near Quigley's. Only a limited quantity is produced.

Union City Salt Co.'s Works.—They are 2 miles W. of Alvarado. Twelve men are employed in summer and six in winter. Osgood Putman, of No. 401 California Street, San Francisco, manager; Thomas Barchgrevink, of Alvarado, superintendent.

Union Pacific Salt Co.'s Works.—They are 3½ miles W. of Alvarado, and are perhaps the most important works in the county. They are said to produce 13,000 to 15,000 tons annually, and handle or control the greater quantity produced by the smaller companies. The evaporation is largely done in "floored," instead of ordinary "mud" vats, which are used by other companies. William Barton, of Mount Eden, superintendent.

Wisby's, L., Works.—They are 2 miles S.W. of Mount Eden. About 3,000 tons are said to be produced annually.

Riverside County.

New Liverpool Salt Co.'s Works.—See our XIth and XIIth Reports, pp. 388 and 409. They are at Salton, in the Colorado Desert. All information refused. A. K. Durbrow, of Salton, superintendent.

San Bernardino County.

Crystal Salt Co.'s Works.—They are about 30 miles S. of Danby, at about 500′ elevation. The salt occurs as a residuary deposit on the floor of a dry lake. Thin layers of sand and clay are interstratified with the salt beds, and a portion of the deposit has been covered by drifting sand. The salt is quarried, hauled by large traction engines across the desert to Danby, and shipped. Thirty-five tons of salt are hauled by a single engine, in wagons built especially for this purpose from thin steel plates. The crude salt is sold for use in silver mills at

Calico, and the best grade is refined and prepared for market. Crystal Salt Co., of San Francisco, owner.

Shasta County.

On Salt or Stinking Creek, 12 miles E. of Redding, is a sandstone strongly impregnated with salt, as are the creek waters. The salt effloresces on the sandstone after rains. Formerly some salt was produced here.

SODA.

Inyo County.

Inyo Development Co.'s Works.—See our VIIIth and XIIth Reports pp. 226 and 409. They are on Owens Lake, in the vicinity of Keeler. The vats have an area of 70 acres, and are filled with water from the lake to a depth of about 15″ as soon as warm weather sets in. Two centrifugal pumps, of 25 H.P. and 10 H.P., keep the depth uniform. The total evaporation of water amounts to about 8′ per year. During 1895, about 1,900 tons of the crude salt was shipped to the refinery, near San Francisco. The lake water contains soda, borax, lime, salt, and other minerals. H. L. Wrinkle, of Keeler, superintendent.

SULPHUR.

Lake County.

Sulphur Banks Mine.—See our Xth and XIIth Reports, pp. 238 and 410. Formerly mined for sulphur, but not now.

ZINC.

Shasta County.

Hobbs Mine.—See our XIIth Report, p. 411. It is 6 miles S. of Round Mountain.

APPENDIX.

The authors of the following papers are alone responsible for all statements of fact and conclusions reached.

PRESERVATION OF STRUCTURAL TIMBER.

By John D. Isaacs,

Chemist for and in charge of Timber-Preserving Plants of the S. P. Co. (Pacific System).

The importance of the preservation of timber for engineering, mining and other purposes has long been recognized. This subject has received much attention among civilized nations during the past two thousand years. A great variety of preservative agents, and of methods of treatment, have been tried, tested, and abandoned. Many processes have given such promise of success as to apparently justify large expenditures of money in their development, and a few have risen to commercial importance; but most methods, when attempted on a large scale, have proven failures.

It is not surprising, in view of the general interest in this subject, and of the prevailing ignorance of its history, that long known and abandoned processes are constantly being revived, and not infrequently the enthusiastic inventor succeeds in sinking his own and other people's money in some project, when an investigation of the state of the art would show that the assumed discovery has long been anticipated.

For these reasons, it is thought advisable to preface a description of practically successful processes in use with a partial enumeration of those tried and abandoned. Besides these, there are some processes which, under certain conditions, are really useful, though not of general application. A brief description of these will also be given.

Among the Greeks, and later the Romans, the following preservatives were used: Oils, tars, resins, and pitches from various woods. These were usually applied superficially, but sometimes holes were bored in the timber to assist penetration. Also, crude soda, common salt, sodium sulphate, and bitumen. Sometimes timber was first soaked in a soda or salt solution, and afterward boiled in bitumen. This evaporated the moisture, crystallized the salt, and supplied an exterior protection, which prevented the washing out of the salt, as well as furnished mechanical protection against exterior attack. This last method was probably used as a protection against the *Teredo navalis*, with which the ancients were well acquainted.

Among the many preservatives tried during the last century, and early in this, the following may be mentioned: Copperas, bluestone, nitrate of silver, corrosive sublimate, sulphate of zinc, carbonate of soda, caustic soda, arsenic, barytes, common salt, quicklime, alum, soap, resin, coal tar, vegetable oils, fish oils, vapors of oils, powdered charcoal, charring, etc. (See "Preservation of Timber" by Boulton, Van Nostrand, 1885; "Preservation of Timber" by Chapman, London, 1817.)

Scarcely a month in the year elapses that some one of the above substances is not brought to the attention of the writer, sometimes with much secrecy, as a great discovery. It is undoubtedly a fact that, under favorable circumstances, some of the above preservative agents answer the purpose fairly well, and the inventor can usually show a fairly sound piece of timber so treated which has been "alongside of" a very much decayed piece not so treated for —— years. Usually the time and extent of the experiment are both limited, and the fact overlooked that the same difference in lasting qualities is observable between the sticks of different periods of growth, times of felling, etc., when neither have had any preservative treatment.

Among later processes the following may be noted:

Lostal's Process.—Used in France for the preservation of thin material, such as lagging, for mining purposes. The plank is piled in tanks, with strips between. It is then covered with quicklime, which is gradually slacked with water. Time of treatment required for 2″ plank, about one week. It is said to work well, and it materially hardens the timber.

Koug's Process.—The timber is packed in a vertical, closed retort, and filled three fourths full with sodium carbolate. It is then boiled by the introduction of a jet of live steam into the carbolate. This is continued until the retort is filled by condensation of the steam. The timber is soaked in the hot liquid for ten to twelve hours. The liquid is drawn off, and the timber finally washed with a steam jet. Crude sodium carbolate may be made by the action of a hot solution of caustic soda on coal tar.

Hock's Process.—The timber is first seasoned by the use of steam in a closed retort. It is then saturated with a solution of paraffin in volatile kerosene; the surplus drained off; the solvent driven from the timber by heat, and recovered in a condenser for future use. This leaves paraffin in the pores of the wood. If the drying is thoroughly done, the process is said to be a preventive of dry rot.

In Holland a superficial protection has long been in use for the protection of large timbers, piles, etc., used in sluices and flood-gates. The surface of the timber is covered with a mixture of tar and pitch, applied hot, over which is sifted powdered shells, forge scale, and sea sand.

Payne's Process.—The timber is impregnated, in closed retorts, with a solution of sulphate of iron (copperas), and afterward treated with lime water. This forms an insoluble exterior coating of gypsum. Instead of lime, alkaline carbonates, such as that of soda, have been used.

There are many mixed processes, similar to the last, which consist of an injection of one substance, followed by a second. In such cases the first is usually the preservative proper and the last is intended to act as a seal, to prevent the evaporation or the leaching out of the former.

But in some processes both injections are preservatives. The following are some of this class:

Name of Process.	First Injection. Solution of—	Second Injection. Solution of—
Jacques	Soap	Tar acids.
Richards	Common salt	Alum.
Müller	Phosphate of soda	Chloride of barium.
Hatzfeld	Tannin	Acetate of iron.
Krug	Soda	Creosote.
Paulet	Sulphate of copper	Creosote.
Wellhouse	Chloride of zinc and glue	Tannin.

The only one of these now in practical use is the Wellhouse process, which is really a variety of burnettizing, hereafter described.

Vulcanizing.—This is a process peculiar to itself. The timber is heated in closed retorts, under pressure, without seasoning, to a temperature sufficient to transform the sap into various organic acids, wood creosote, etc. The difficulties with this process seem to be, (1st) while the preservative constituents may be sufficient in quantity to act somewhat like creosote, if they were concentrated near the surface, they are too much distributed for their quantity throughout the timber; and (2d) wood creosote, which is a part, and probably the most important part, of the results of the process, is not an effective preservative of wood.

The following is a brief statement of the theory of timber preservation as now understood: Timber may be destroyed, *First*—By being eaten away or consumed by external attack, such as that of the *Teredo navalis*, *Limnoria terebrans*, ants, bugs, etc. Almost any dense pitchy substance, insoluble in water, and so applied as to adhere firmly to the exterior of the wood, without openings or cracks, will, in a measure, prevent destruction from this cause. But those preservatives are the most effective which contain coagulants of albumen, since the spawn of most of the enemies of timber are albuminous cells, to which contact with such preservatives means instant death. *Second*—By decay, rotting, and dry rot. Like most vitalized bodies, timber begins to decay when deprived of life. This process is brought about by the ever-present myriads of germs in the atmosphere. In this process the nitrogenous portions of the sap, such as albumen, play an important part. There are, therefore, two ways in which the process of decay may be arrested, and further decay prevented, (*a*) by introducing throughout the timber a permanent germicide; (*b*) by destroying with heat, sufficiently prolonged, those germs already in the timber, coagulating thoroughly the albuminous constituents of the sap, and immediately sealing or inclosing the timber with a protective coat through which fresh germs of decay cannot penetrate. We may, therefore, divide timber preservation, as now practiced, into two general methods:

First—Saturating the timber with an antiseptic solution;

Second—Sterilizing and desiccating the timber by heat and sealing it with a preservative and protective coat.

During the past fifty years four principal methods of treatment have assumed commercial importance. Three of these belong to the former of the above classes, and one to the latter. They are:

(*a*) Impregnation with sulphate of copper, known as Boucherizing.
(*b*) Impregnation with corrosive sublimate, known as Kyanizing.
(*c*) Impregnation with chloride of zinc, known as Burnettizing.
(*d*) Creosoting.

Under these general heads there are many varieties of treatment, but the first two, either from failures, expense, poisonous nature of the substance used, or other causes, are gradually falling into disuse. So that there remain now in the field practically only the last two.

BURNETTIZING.

This process was proposed by Sir W. Burnett, in 1838. It has been in constant use in Hanover since 1849, and later has been adopted as a standard method throughout Germany and Austria. It was introduced into the United States in 1850, but has been extensively used only within the past twenty years. This process, so far, is principally in use for the treatment of railroad ties, but there seems to be no reason why it should not be successfully used to prolong the life of timber for mining purposes.

The process of Burnettizing is simple. The timber is dried by steam, and the antiseptic solution then forced in.

The theory of the use of chloride of zinc is that this substance is both an antiseptic and a powerful coagulant of albumen.

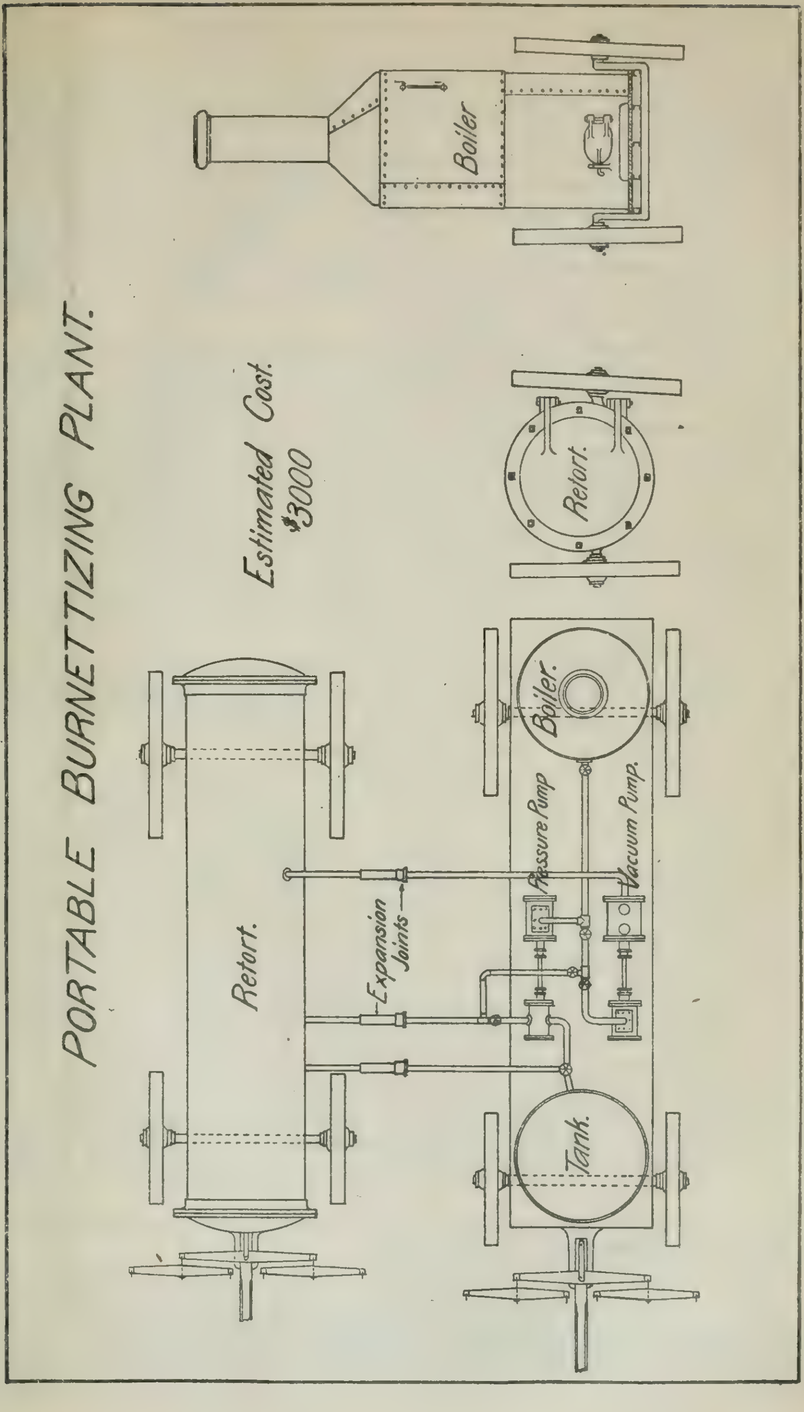
It is not considered necessary to thoroughly impregnate the timber throughout, during the process of treatment, with the zinc chloride solution, as the salt diffuses itself after treatment, provided a solution of sufficient strength be first used. Too strong a solution is to be avoided, because the zinc combines with constituents of the sap, liberating hydrochloric acid, which, if too strong, injures the wood fiber. Practice limits the strength of the solution to a minimum of 1.5% and a maximum of 2.0%. If less than the minimum, it may not be long effective. If more than the maximum the fiber may be injured.

Chloride of zinc is cheaply and easily made by simply immersing zinc in muriatic acid until the acid is saturated, leaving no free acid to attack the piping, etc. This salt is now largely manufactured both in the Eastern States and on this coast. Its cost in San Francisco is now about 4½ cents per pound in large quantities.

The apparatus for treatment is simple. It consists of one or more retorts, a boiler, a vacuum pump, a pressure pump, one or more storage tanks, and suitable piping. For short timber a plant could easily be arranged to be hauled around on wheels like an ordinary wagon. If steam is otherwise available, the boiler can be omitted. With such a plant having a retort, say 3½′ to 4′ in diameter, and 16′ long, very effective work could be done in preserving timber to be used in mines.

The process, in detail, consists in placing the timber to be treated in a closed retort, introducing live steam at 30 lbs. pressure, allowing the mixed sap and condensed water to drain off during this steaming, until the liquid shows little or no resinous constituents. Vents are then opened, and the steam blown off. A vacuum is then produced by a vacuum pump. This is continued until a condenser shows condensation at a rate per hour equal to ½ lb. of water per cubic foot of timber. The retort is then filled with hot chloride solution, and the required quantity of solution forced into the timber by a pressure pump. The entire process, with large retorts holding 18,000′ B.M. of timber, usually requires a little less than seven hours' time.

Chloride of zinc alone is not usually regarded as a permanent preservative of timber, but the time to which its use prolongs the life of



PORTABLE BURNETTIZING PLANT.

Estimated Cost. $3000

timber is not definitely known. It is certain, however, that it effects considerable ultimate economy in the cost of timbering.

It is often asserted that, owing to the extreme solubility of zinc chloride, it will soon leach out of timber exposed to rain or to much moisture. The author thinks that this objection is greatly exaggerated. He has attempted to leach this chloride out of timber with running water, but could extract only an insignificant portion, even when the timber was in fine shavings. All the chloride could not be taken out of chips from treated timber by boiling in repeated changes of water. If leaching takes place, it is certainly very slowly. This process hardens timber considerably. It allows the use of sap and other second quality timber. In some cases the saving in cost, in this respect, more than offsets the expense of treatment.

Protection Against Fire.—This process renders timber much less combustible, and is, therefore, valuable as a fire preventive. All soluble chlorides have a great affinity for moisture. They will cause any substances, impregnated with them, to remain moist, and, therefore, much less inflammable than if untreated. Common salt (sodium chloride) has long been known as a fire preventive for timber. In a paper by Mr. Robert Martin, and in the discussion following (see Trans. Mining Inst. of Scotland, Parts 3 and 4, February and April, 1896), will be found an interesting account of the use of a mixture of sodium and magnesium chlorides for the fire protection of mining timbers. In this paper the remark is made that the "salted timber is easily distinguished from other timber by its damp appearance."

The Société d'Encouragement de Paris about ten years ago awarded a prize of 2,000 francs for a fire-proofing solution to be applied to theatrical scenery, woodwork, etc. The principal effective ingredient of this solution was sal ammoniac (ammonium chloride).

Zinc chloride is extremely hygroscopic, much more so than either salt or sal ammoniac. Its affinity for moisture is such that it will keep timber damp in the driest climate. Timber containing an amount of this chloride sufficient for its preservation cannot be ignited until after the long application of a high temperature. The following experiments have been recently made on the combustibility of burnettized timber: Two boards, each 1″x 6″ and 2′ long, as nearly alike as possible, except that one was burnettized and the other untreated, were placed side by side closely under the grates in the ashpit of a boiler. At the end of forty minutes the untreated stick was entirely consumed; the treated stick was charred one quarter inch deep. Two pieces of burnettized timber, one pine, the other red fir, each 4″ square, and two pieces of the same timber, same size but untreated, were placed on a hot blazing fire simultaneously. The untreated pieces blazed up at once and were consumed; the burnettized pieces smouldered an hour before they could be ignited. All these pieces were dried as far as possible before the experiment.

The net cost of burnettizing at San Francisco in large quantities is about $3 per 1,000′ B.M., for treatment.

Burnettizing is largely used by the Southern Pacific Company, the Atchison, Topeka & Santa Fe Company, and many other large railroad systems for the preservation of ties, tunnel and other timber.

In purchasing chloride of zinc the following are recommended specifications:

BURNETTIZING TABLE.

June, 1896. J. D. I.

	% Zinc Chloride.	Degrees Beaumé.	Specific Gravity.	Weight per Gal.	PROPORTIONAL PARTS.																									
Gallons Standard Solution	$1\frac{5}{10}$	$2\frac{1}{4}$	1.0150	8.462	1.	1.068	1.135	1.203	1.271	1.339	1.407	3.151	3.240	3.309	3.388	3.466	3.545	3.624	3.703	3.782	3.860	3.938	7.878	16.439	14.795	14.679	4.708	5.105	5.966	1.914
" " "	$1\frac{6}{10}$	$2\frac{3}{8}$	1.0159	8.470	0.937	1.	1.063	1.127	1.190	1.254	1.318	2.952	3.025	3.099	3.173	3.247	3.320	3.394	3.468	3.542	3.616	3.689	7.379	15.397	13.858	13.748	4.410	4.782	5.579	1.793
" " "	$1\frac{7}{10}$	$2\frac{1}{2}$	1.0167	8.476	0.881	0.941	1.	1.060	1.119	1.179	1.239	2.776	2.845	2.915	2.984	3.054	3.123	3.192	3.262	3.331	3.401	3.470	6.940	14.481	13.033	12.930	4.147	4.497	5.247	1.686
" " "	$1\frac{8}{10}$	$2\frac{5}{8}$	1.0175	8.483	0.831	0.888	0.944	1.	1.056	1.113	1.170	2.620	2.685	2.761	2.816	2.882	2.947	3.013	3.078	3.144	3.209	3.275	6.549	13.665	12.299	12.202	3.914	4.244	4.951	1.591
" " "	$1\frac{9}{10}$	$2\frac{3}{4}$	1.0183	8.490	0.787	0.840	0.893	0.947	1.	1.053	1.107	2.480	2.542	2.604	2.666	2.728	2.790	2.852	2.914	2.976	3.038	3.100	6.199	12.937	11.642	11.550	3.705	4.017	4.687	1.506
" " "	2.	$2\frac{7}{8}$	1.0192	8.497	0.747	0.797	0.848	0.899	0.949	1.	1.051	2.354	2.413	2.471	2.530	2.589	2.648	2.707	2.766	2.825	2.883	2.942	5.884	12.279	11.051	10.964	3.516	3.813	4.449	1.430
" " "	$2\frac{1}{10}$	3	1.0200	8.504	0.711	0.759	0.807	0.855	0.903	0.952	1.	2.240	2.296	2.352	2.408	2.464	2.520	2.576	2.632	2.688	2.744	2.800	5.600	11.684	10.516	10.433	3.346	3.629	4.233	1.361
Pounds Stock "	40	45	1.420	11.830	0.317	0.339	0.360	0.382	0.403	0.425	0.446	1.	1.025	1.050	1.075	1.100	1.125	1.150	1.175	1.200	1.225	1.250	2.500	5.217	4.695	4.658	1.494	1.620	1.890	0.606
" " "	41	46.2	1.434	11.956	0.310	0.331	0.351	0.372	0.393	0.414	0.436	0.976	1.	1.024	1.049	1.073	1.098	1.122	1.146	1.171	1.195	1.220	2.439	5.089	4.580	4.544	1.458	1.580	1.844	0.593
" " "	42	47.4	1.447	12.064	0.302	0.323	0.343	0.360	0.384	0.405	0.425	0.952	0.976	1.	1.024	1.048	1.071	1.095	1.119	1.143	1.167	1.190	2.381	4.968	4.471	4.437	1.423	1.543	1.800	0.579
" " "	43	48.6	1.461	12.181	0.295	0.315	0.335	0.355	0.375	0.395	0.415	0.930	0.953	0.977	1.	1.023	1.046	1.070	1.093	1.116	1.140	1.163	2.326	4.853	4.367	4.333	1.390	1.507	1.758	0.565
" " "	44	49.8	1.474	12.289	0.289	0.308	0.327	0.347	0.367	0.386	0.406	0.909	0.932	0.955	0.977	1.	1.023	1.045	1.068	1.091	1.116	1.136	2.273	4.742	4.268	4.234	1.358	1.473	1.718	0.552
" " "	45	51.	1.488	12.406	0.282	0.301	0.320	0.339	0.358	0.377	0.397	0.889	0.911	0.933	0.956	0.978	1.	1.022	1.044	1.067	1.089	1.111	2.222	4.637	4.173	4.140	1.328	1.440	1.680	0.540
" " "	46	52.2	1.504	12.539	0.276	0.295	0.313	0.332	0.351	0.369	0.388	0.870	0.891	0.915	0.935	0.957	0.978	1.	1.021	1.043	1.065	1.087	2.174	4.536	4.083	4.050	1.299	1.409	1.643	0.528
" " "	47	53.4	1.519	12.664	0.270	0.288	0.307	0.325	0.343	0.362	0.380	0.851	0.872	0.894	0.915	0.936	0.957	0.979	1.	1.021	1.043	1.064	2.128	4.440	3.996	3.964	1.271	1.379	1.609	0.517
" " "	48	54.6	1.535	12.798	0.264	0.282	0.300	0.318	0.336	0.354	0.372	0.833	0.854	0.875	0.896	0.917	0.938	0.958	0.979	1.	1.021	1.042	2.083	4.347	3.912	3.882	1.245	1.350	1.575	0.506
" " "	49	55.8	1.550	12.923	0.259	0.277	0.294	0.312	0.329	0.347	0.364	0.816	0.837	0.857	0.878	0.898	0.918	0.939	0.959	0.980	1	1.020	2.041	4.258	3.833	3.802	1.220	1.322	1.543	0.496
" " "	50	57.	1.566	13.056	0.254	0.271	0.288	0.305	0.323	0.340	0.357	0.800	0.820	0.840	0.860	0.880	0.900	0.920	0.940	0.960	0.980	1.	2.000	4.173	3.756	3.735	1.195	1.298	1.512	0.486
" Pure Zinc Chloride = $ZnCl_2$					0.127	0.136	0.144	0.153	0.161	0.170	0.179	0.400	0.410	0.420	0.430	0.440	0.450	0.460	0.470	0.480	0.490	0.500	1.	2.087	1.878	1.867	0.598	0.648	0.756	0.243
" " Metallic Zinc = Zn					0.061	0.065	0.069	0.073	0.077	0.081	0.086	0.192	0.197	0.201	0.206	0.211	0.216	0.220	0.225	0.230	0.235	0.240	0.479	1.	0.900	0.893	0.286	0.311	0.362	0.116
" Zinc Dross = 90% Zn					0.068	0.072	0.077	0.081	0.086	0.090	0.095	0.213	0.218	0.223	0.229	0.234	0.240	0.245	0.250	0.256	0.261	0.266	0.532	1.111	1.	0.992	0.318	0.345	0.403	0.129
" Pure Hydrochloric Acid Gas = HCl					0.068	0.073	0.077	0.082	0.087	0.091	0.096	0.215	0.220	0.225	0.231	0.236	0.242	0.247	0.252	0.258	0.263	0.268	0.537	1.120	1.008	1.	0.321	0.348	0.406	0.130
" Commercial Muriatic Acid = 32% HCl					0.212	0.227	0.241	0.256	0.270	0.284	0.299	0.669	0.686	0.703	0.720	0.736	0.753	0.770	0.786	0.803	0.820	0.837	1.673	3.492	3.142	3.118	1	1.084	1.265	0.407
Number of Ties 6" x 8" x 8'					0.196	0.209	0.222	0.236	0.249	0.262	0.276	0.617	0.633	0.648	0.664	0.679	0.694	0.710	0.725	0.741	0.758	0.772	1.543	3.220	2.898	2.875	0.922	1.	1.167	0.375
" " " 7" x 8" x 8'					0.168	0.179	0.191	0.202	0.213	0.225	0.236	0.529	0.542	0.556	0.569	0.581	0.595	0.608	0.622	0.635	0.648	0.661	1.322	2.760	2.484	2.465	0.790	0.857	1.	0.321
Cubic Feet of Timber					0.522	0.558	0.593	0.628	0.664	0.699	0.735	1.646	1.687	1.728	1.770	1.811	1.852	1.893	1.934	1.975	2.016	2.058	4.115	8.587	7.728	7.667	2.450	$2\frac{2}{3}$	$3\frac{1}{9}$	1.

Pure Solid	Formula,	Molecular Weight,	Normal Factor,	Sp. Grav.,	Melting P't,	Sublimes at	Solubility in Water.		Solubility in Alcohol,
Chloride of Zinc.	$ZnCl_2$.	135.84.	0.06792.	2.758.	400° C.	Red Heat.	At 15° C = 3 in 1.	At 100° C in all Proportions.	1 in 1.

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Atchison, Topeka & Santa Fe Company, and many other large railroad systems for the preservation of ties, tunnel and other timber.

In purchasing chloride of zinc the following are recommended specifications:

If crystallized, fused, or granular, it must contain not less than 97% of pure zinc chloride.

If in solution, it must contain about 45% of pure zinc chloride, not more than 2% of other salts, and the rest water; it must contain no free acids.

If the zinc chloride as received is found to contain free acid, slab zinc should be immersed in it and allowed to remain until a piece of polished zinc, free from grease, shows no action after immersion for twelve hours.

The presence of free acid of any kind in zinc chloride may be easily detected by diluting the salt to about the strength to be used, say 2%, and adding to 100 c.c., a drop of a $\frac{1}{1000}$ solution of methyl orange. In the presence of free acid this gives a pink indication, but the chloride is neutral to the indicator.

The strong solution of zinc chloride as furnished by the manufacturer is known as "stock solution of zinc chloride." It contains about 45% of zinc chloride and more or less of chlorides of other bases, some sulphate of zinc, and some oxide of zinc. The solid chloride of zinc is sold under various names, such as "fused" and "granular." It is the same stock solution evaporated down and melted. It is then broken up and packed in thin iron drums for shipment. It usually contains the same impurities as the stock. After dilution for use the solution is called "standard solution." The accompanying table has been found almost indispensable by the author in the operation of large burnettizing plants.

In this table, and opposite each item in the first column, will be found a unit; above and below this are the equivalent parts of all other items of the first column. Many check experiments have been made to verify this table.

Example.—How many pounds of stock solution 46% zinc chloride will be required to burnettize 50,000 cu. ft. of timber?

Opposite "cubic feet of timber" in the lower right-hand corner of the table, will be found the figure 1; above this, in the line opposite "Pounds stock 46% zinc chloride," will be found 0.528; this is the amount of such stock required for one cubic foot of timber; hence,

$$0.528 \times 50{,}000 = 26{,}400 \text{ lbs. required.}$$

Example.—On hand 10,000 lbs. of metallic zinc. How many pounds of 32% commercial muriatic acid will be required to convert all the zinc into chloride? How many pounds of 45% stock solution will result? How many gallons of $1\frac{7}{10}\%$ standard solution can be made therefrom? And how many 6″x 8″x 8′ ties can be treated therewith?

Follow the horizontal line opposite metallic zinc until 1 is found; above and below this, in the same vertical column, and on the same horizontal line as the item sought, will be found the proper multiplier for each case. Thus:

Commercial muriatic acid required	$3.492 \times 10{,}000 = 34{,}920$ lbs.
45% stock solution obtained	$4.637 \times 10{,}000 = 46{,}370$ lbs.
$1\frac{7}{10}\%$ standard solution obtained	$14.481 \times 10{,}000 = 144{,}810$ gals.
6″ x 8″ x 8′ ties treated	$3.220 \times 10{,}000 = 32{,}200$.

CREOSOTING.

This process consists in injecting hot creosote, or dead oil of coal tar, into timber with pressure, the timber having been previously dried by appropriate methods.

This process was invented by John Bethell, in England, about the year 1838. It was introduced into the United States in 1854. Its use has constantly increased since, and it is now an important industry. In the Eastern States there are many large plants for the treatment of timber with creosote. Among these the most extensive and best known are: That of the Lehigh Valley Railroad, at Perth Amboy, N. J.; of Eppinger & Russell, at Long Island City, N. J.; of the Atchison, Topeka & Santa Fe Railroad, at Las Vegas, N. M.

On this coast the Southern Pacific Company has two plants in which this process is worked.

An essential condition for success with this process is a *suitable creosote properly applied.*

In the manufacture of ordinary illuminating gas, by the destructive distillation of bituminous coal, the following are produced: Illuminating gas, ammoniacal liquor, coke, and coal tar. Of these the last is further distilled into naphthas, pitch, and heavy or dead oils. This last is the creosote (so called) used in timber preservation. It is unfortunate that this substance should be known commercially as creosote, since it really contains only a very minute percentage of true creosote, such as is used in dentistry. The name creosote seems to have been given it from its similarity in smell to true creosote. As, however, it is universally known by this name, it will be so called in the rest of this article.

The principal necessary ingredients of a good creosote for timber preservation are: About 8% of tar acids or phenols-carbolic and cresylic acids; about 20% of naphthalene; about 30% of heavy residuum after distillation up to 600° F., consisting principally of anthracene and pitch. The remainder, light and heavy oils, principally of use as solvents for the necessary ingredients.

Creosote should contain no ammonia or water. It should be completely liquid at 100° F., in order to enable it to be easily handled by pumping, and in cooling should show little or no deposit above 90° F. It should contain no ingredients soluble in water.

At one time much stress was laid upon the toxic effect of certain alkaloids present in coal tar creosote; these are acridine and cryptidine, but their beneficial effect has not been demonstrated.

It appears to be a fact that only a creosote constituted as above will insure satisfactory results, and as these qualities, in such combination, are found only in the dead oil of coal tar, it is customary to specify that the creosote must be the product of bituminous coal tar only. This excludes creosote made from wood tar or from petroleum tar.

The timber to be treated is first dried in retorts by steam applied either directly or to a bath of creosote in which the timber is immersed. When thoroughly dried, creosote is injected by pressure.

During this process the timber is first thoroughly sterilized and desiccated by heat, and immediately afterward sealed externally by creosote. All albuminous ingredients of the sap are coagulated by heat and the liquid or volatile tar acids and naphthalene. All germs are destroyed, and an external protection afforded through which fresh germs cannot penetrate. The superficial coat of heavier material affords efficient protection against external attack by the teredo, limnoria, etc.

During injection a mechanical separation of the creosote takes place to some extent. The lighter and more fluid tar acids and naphthalene penetrate farthest, while the heavier portions, mostly the residuum above referred to, remain near the surface by filtration. Good practice requires that there should be sufficient "black" penetration to prevent its being torn away, in the ordinary handling and shipment necessary, by timber hooks, etc. For piles this requires not less than 10 lbs. of creosote per cubic foot of timber, and for smaller timber proportionately more, so as to give the same superficial penetration. For important work it is better to allow 14 lbs. per cubic foot to insure success. But so long as there is a sufficient external coat to insure protection to the interior there seems to be no object in applying more.

The increased demand for the heavier portions of creosote in the manufacture of artificial madder and for roofing pitch renders it difficult to obtain cheaply creosote having a sufficiency of residuum. This has led the author to make some experiments on mixing with a lighter creosote, a proper portion of asphalt, so as to supply the necessary heavy constituents. The asphalt used for this purpose should be nearly solid at ordinary temperature, but not hard or brittle. When such asphalt and creosote are heated and stirred together, an intimate mixture results. This does not separate on cooling, and the resulting compound acts, as far as yet ascertained, in all respects as ordinary creosote, except that it is more fluid than either the original creosote or the original asphalt at the same temperature. Apparently a chemical combination of some kind takes place, changing somewhat the physical properties of the original ingredients. But our experience with this mixture is not yet sufficiently extended to warrant its recommendation for general use.

The net cost of creosoting in San Francisco with a properly designed plant, and at current rates for labor and material, for injecting 10 lbs. of creosote per cubic foot, is about $20 per 1,000′ B.M. The creosote costs about 13 cents per gallon in San Francisco. It is manufactured on a large scale in the Eastern States, in England, and to some extent on this coast.

IN GENERAL.

It is not to be supposed that any mode of timber preservation now known will, under all circumstances, prolong the life of timber indefinitely. It may be relied upon that *burnettizing* will extend the life of timber to at least double that which it would have if untreated, and that *creosoting* properly done will preserve timber, under the most unfavorable circumstances, for at least twenty-five years. These conclusions are the results of a great many observations and records.

In the matter of wood preservation the following axioms may be regarded as well established:

No process can be considered as generally effective which affords superficial protection only; such treatment may defend timber against external attack, but it provides no protection against internal decay.

Unless preservative treatment is properly done, using proper materials, it is a waste of time and of money. As a corollary to this, no material should be used for wood preservation until its suitability has been determined by analysis, and no finished product accepted until after thorough inspection.

RESUME OF ORIGINAL RESEARCHES, ANALYSES, AND REFINING METHODS OF PETROLEUM, MAINLY FROM THE SOUTHERN COUNTIES OF CALIFORNIA.

By Frederick Salathè, Ph.D.

ORIGIN.

The opinions on the origin of petroleum still differ widely among chemists, but through the classic researches recently made by Engler, who has produced the complete series of paraffins, identical with the petroleum-hydrocarbons, by synthesis from fish oils under pressure during distillation, the theory of animal origin of petroleum has become most plausible.

The question has been asked, what has become of the nitrogen, if petroleum was formed of marine animals, and why are most of the petroleum-hydrocarbons free from nitrogen combinations?

Analysis of some natural gas from a well in Pennsylvania shows the presence of nitrogen in natural gas, which in one instance amounted to 23% by volume.

In 1892, I began an investigation on the hydrocarbon series constituting the Ventura County crude oils, which I found to contain invariably from 0.75% to 3.5% of nitrogen. The experiments were conducted in such a manner as to ascertain in what form or combination the nitrogen existed in the crude petroleum, with the view of isolating the nitrogenous hydrocarbons.

The result was the identification of a number of organic bases of the Pyridin and Chinolin series, which heretofore were only found in the so-called animal tar from the distillation of animal cadavers or bones.

The presence of these organic bases in the California petroleum indicates, therefore, clearly the origin of this petroleum from animal matter furnished by the slow decay of a marine fauna, which became extinct by changes of the sea-water through local influx of saline mother liquors.*

ELEMENTARY ANALYSIS.

The sample of crude petroleum represented an average mixture of Ventura County crude oils of 23.5° B., or 0.9120 specific gravity.

Carbon	84.0%
Hydrogen	12.7
Nitrogen	1.7
Oxygen	1.2
Sulphur	0.4
	100.0%

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*Theory advanced by Oechoener, Engler, Zalociecke. More detailed reference will be found in a paper on the origin of petroleum, read by writer, April, 1894, before the Technical Society of the Pacific Coast.

CHEMICAL CONSTITUTION AND HYDROCARBON SERIES OF VENTURA AND LOS ANGELES COUNTIES CRUDE OILS.

These crude oils, which all carry asphalt, held in combination with the high boiling members of the hydrocarbon series, are of a very complex constitution, which makes their refining exceedingly difficult. By a series of chemical reactions and fractional distillations, I have succeeded in isolating various hydrocarbons, which define clearly the presence of the following hydrocarbon series:

(*a*) Hydrocarbons of the Paraffin, or fatty, series. C_nH_{2n+2}.

(*b*) Hydrides or Hydron addition-products of the Benzole series. C_6H_{12} and homologous hydrocarbons.

(*c*) Pyridin and Chinolin series. $C_nH_{2n-5}N$ and $C_nH_{2n-1}N$.

(*d*) Isomeres of the Terpene series. C_nH_{2n-4}.

(*a*) *Hydrocarbons of the Paraffin series*, C_nH_{2n+2}. These were separated by successive treatment of crude oil and its fractions with fuming sulphuric acid containing 20% sulphuric anhydride in solution, nitric acid 43° B., chromic acid, potassium-hydrate, followed by fractional distillations. Owing to the great difficulty of isolating the high boiling members, whose boiling-points are very close together, I examined the fraction boiling between 80° and 100° C., and isolated and identified in the same *Heptane*, C_7H_{16} of 97° C. boiling-point. By chlorination and subsequent decomposition of the chlorides, Heptylic alcohol was formed. Crystallizable paraffin could not be detected in any of the heavy fractions. At 20° C. a slight cloudiness appeared in the oils, caused by the presence of traces of colloidal paraffin, such as constitutes the liquid paraffins in Eastern oils.

(*b*) *Hydrides of the aromatic or Benzole series*, C_nH_{3n-6}. These hydrocarbons could only be separated and identified from the residue obtained by the treatment of the original oil with fuming sulphuric acid, and were in form of sulpho-conjugated derivatives of the Benzole series, yielding, when melted with caustic potassa, Phenol and its homologous oxy-products, which I have under further investigation.

The great facility with which California oils produce, by pyrogenic action, Benzole. and its homologues, which process the writer has especially studied, further illustrates the presence of hydrides of the aromatic series.

(*c*) *Pyridin and Chinolin series*, C_nH_{2n-} and $C_nH_{2n-11}N$. I obtained and isolated this group of basic hydrocarbons by extraction of the California crude oil and its fractions with dilute sulphuric acid, 1:5, at 212° F. The acid solution containing the organic bases in the form of sulphates was then steamed until no more volatile oils, mainly Pyrrol, passed over with the aqueous vapors. The bases were then precipitated by potassium hydrate in form of yellowish-gray flocks, which, by prolonged heating on the waterbath, formed a supernatant oil of a reddish-brown color and of the characteristic penetrating odor of the Pyridin bases. The crude basic oils showed a specific gravity of 0.9985. By moderate oxidation with permanganate of potassium the basic hydrides were first converted into normal bases, while at the same time the formation of small quantities of *α* Pyridin-monocarbonic acid was observed derived from partial oxidation of the homologous bases of Pyridin. The resulting bases were then dried over potassium hydrate and submitted to fractional distillations in the following fractions:

From 115° to 121° C., specific gravity = 0.9580
" 132° " 138° C., " " = 0.9610
" 137° " 170° C., " " = 0.9735
" 169° " 180° C., " " = 0.9890
" 179° " 200° C., " " = 1.0500
" 199° " 250° C., " " = 1.0860
" 249° " 320° C., " " = 1.1200

From fraction 115° to 121° C. pure Pyridin was isolated, by forming the insoluble Ferro-cyanide and the Platino-chloride combination. It distilled at the constant temperature of 116° C.

The next homologous base, the α Picolin or α Methyl-pyridin, was isolated from fraction 132° to 138° by converting the same into the Picolin-ferrocyanide combination, which is easily soluble in water, and which by double decomposition with alkali yielded α Picolin of 140° boiling-point.

The Pyridin and α Picolin showed all the characteristics of these bases made from animal tar. The higher homologous bases, such as Lutidin, Collidin, etc., have not yet been isolated by me except that their presence is indicated by the uniform rise in the boiling-points of fractions. In continuing the distillation above 300° C. considerable ammonia-gas is generated, which is formed by the action of the high temperature on the heavier basic products. All fractions above 200° C. possess a remarkable, fine crimson fluorescence. By carrying the distillation to 360° C., a glossy, hard, asphalt-like substance remains in the still; diluted sulphuric acid, 1:5, dissolves the same to the greatest part and alkalies precipitate from the filtered solution a crystalline powder which probably contains a number of unknown solid nitrogenous hydrocarbons of the Pyridin or Chinolin series, parallel with Anthracene, Phenanthrene, Chrysene, etc., from coal tar.

The presence of Chinolin and its homologues was demonstrated by the Cyanin reaction, a blue color, which is formed from the Iodin derivatives of Chinolin and its homologues.

The occurrence of Pyridin and Chinolin bases in California crude oils opens up a new resource for these products, which are largely used for the synthetical production of alkaloids, dyes, etc., and in a large measure for 'denaturalizing' alcohol in Europe.

(*d*) *Isomeric Hydrocarbons of the Terpene series*, C_nH_{2n-4}. These hydrocarbons enter easily into polymerization and thus form the greatest part of the asphaltic constituents usually termed Petrolene and Asphaltene, which terms I use instead of Retinoid and Retene; the former being a series of polymerized hydrocarbons, the latter their oxidation product.

The investigation on these hydrocarbons is not far enough advanced for publication.

(*e*) *Sulphureted Hydrocarbons.* These of the California crude oils differ in their chemical constitution from the sulphureted Trenton lime oils of Ohio or Canada, mainly in that the sulphur is for the greatest part only confined by chemical substitution to the highest boiling constituents, the asphalt, and is practically transferred by chemical action to *the middle fractions during distillation* in the form of sulphur-addition products, another part escaping in the form of sulphureted hydrogen.

Distillation over soda lime or passing the vapors over the same completely eliminates the sulphur from the hydrocarbons; this is not the case with Ohio or Canada oils.

PRACTICAL DISTILLATIONS AND YIELDS OF VARIOUS SOUTHERN CALIFORNIA CRUDE OILS.

1. *Sespe oil*, of 25.2° B. or 0.9022 specific gravity at 60° F.

Naphtha, 60° B. at 150° C.	7.30%	
Illuminating distillate, 42° B. at 330° C.	19.50	
Gas distillate, 28° B.-above 360° C.	25.00	
Lubricating distillate, 24° B.-above 360° C.	35.80	
*Asphalt and Loss	12.40	
		100.00%

The Pyridin bases equal 2.30%

2. *Crude Oil from Four Forks*, of 24° B. or 0.9090 specific gravity.

Naphtha	6.00%	
Illuminating distillate	17.10	
Gas distillate	29.50	
Lubricating distillate	34.40	
Asphalt and Loss	13.00	
		100.00%

The Pyridin bases equal 1.75%.

3. *Crude Oil from Torrey Cañon*, of 27° B. or 0.8917 specific gravity.

Naphtha	9.20%	
Illuminating distillate	21.50	
Gas distillate	26.00	
Lubricating distillate	30.30	
Asphalt and Loss	13.00	
		100.00%

The Pyridin bases equal 1.52%.

4. *Crude Oil from Lime Kiln Cañon* (Eureka Oil Co.), of 29° B. or 0.8805 specific gravity.

Naphtha	14.10%	
Illuminating distillate	26.40	
Gas distillate	24.00	
Lubricating distillate	27.00	
Asphalt and Loss	8.50	
		100.00%

The Pyridin bases equal 1.44%.

5. *Crude Oil from Adams' Cañon* (Tunnel Oil), greenish oil of 24° B. or 0.9090 specific gravity.

Naphtha	5.20%	
Illuminating distillate	24.50	
Gas distillate	17.30	
Lubricating distillate	46.00	
Asphalt and Loss	7.00	
		100.00%

The Pyridin bases equal 0.88%.

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*The gravities of the products, Naphtha, etc., are the same in all the following analyses of crude oils, as in No. 1, Sespe oil.

6. *Crude Oil from Los Angeles Wells*, of 14.2° B. or 0.9708 specific gravity.

Naphtha	Traces.	
Illuminating distillate	6.00%	
Gas distillate	17.50	
Lubricating distillate	51.50	
Asphalt and Loss	25.00	
		100.00%

The Pyridin bases equal 3.2%.

This crude oil contains usually from 2.5% to 7% of water and 0.16% to 2% of suspended mineral matter, mainly a fine silicious clay.

7. *Fresno County Crude Oil, from Coalinga*, of 54° B. or 0.7608 specific gravity.

This oil represents a distillate made by nature, nearly all fractions having a very low fire test.

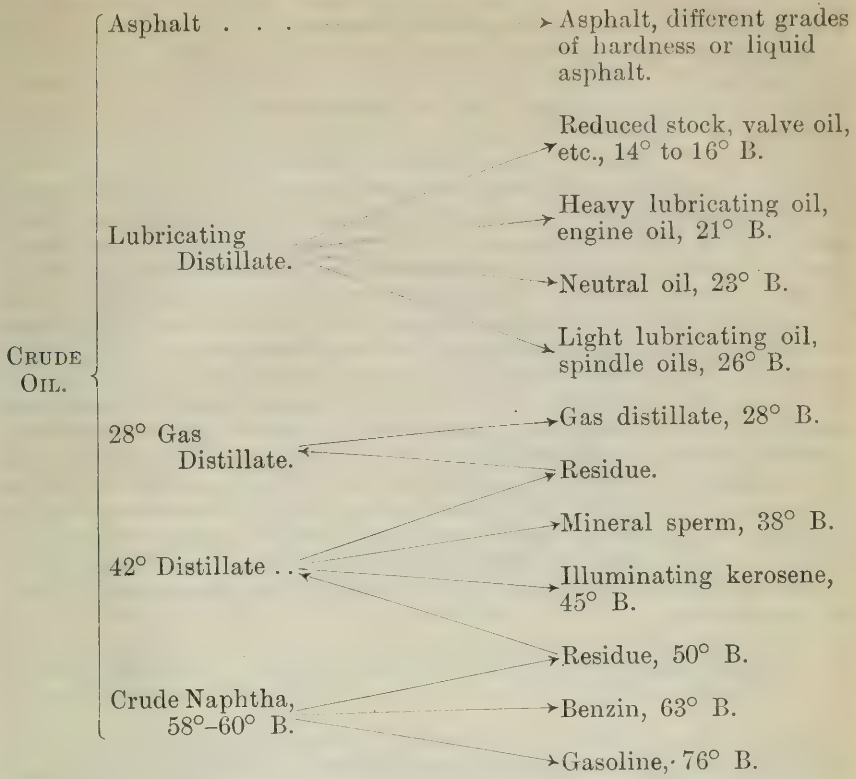
Fraction	1.	10%,	at temperature from	49°	to	111° C.
"	2.	10%,	" " "	110°	"	121° C.
"	3.	10%,	" " "	120°	"	141° C.
"	4.	10%,	" " "	140°	"	161° C.
"	5.	10%,	" " "	160°	"	176° C.
"	6.	10%,	" " "	175°	"	196° C.
"	7.	10%,	" " "	195°	"	227° C.
"	8.	10%,	" " "	226°	"	249° C.
"	9.	10%,	" " "	248°	"	275° C.
"	10.	10%,	Residue is hard asphalt.			

REFINING.

From the investigations given so far it is evident that the refining of the crude California oils is not an easy task and that they require refining methods different from those practiced with Eastern or Russian oils.

The complicated nature of this class of asphaltic crude oils necessitates complete elimination of all unstable hydrocarbons by inexpensive practical processes. Another great difference exists between the specific gravities of Eastern oil distillates and those of California oils. Viscosity of distillate or reduced stock being equal, the gravities are from 5° to 6° B. lower in California oil fractions than in those of Eastern oils. Flash and fire tests are from 10° to 30° F. lower in California oil distillates than in Eastern distillates of the same gravity.

The following is a diagram of products available from California crude oil by refining, showing where redistillation is required:


Crude Oil.
Asphalt . . .
Lubricating Distillate.
28° Gas Distillate.
42° Distillate . .
Crude Naphtha, 58°–60° B.
Asphalt, different grades of hardness or liquid asphalt.
Reduced stock, valve oil, etc., 14° to 16° B.
Heavy lubricating oil, engine oil, 21° B.
Neutral oil, 23° B.
Light lubricating oil, spindle oils, 26° B.
Gas distillate, 28° B.
Residue.
Mineral sperm, 38° B.
Illuminating kerosene, 45° B.
Residue, 50° B.
Benzin, 63° B.
Gasoline, 76° B.

The average yield of products from 100 bbls. of Ventura County mixed crude oil of 24° B., determined by actual running on a large scale, is as follows:

Gasoline, 76° B.	3 bbls.
Benzin, 63° B.	4 "
Kerosene, 45° B.	15 "
Heavy kerosene, 38° to 40° B.	8 "
Gas distillate, 28° B.	21 "
Light lubricating (spindle) oil, 26° B.	10 "
Neutral oil, 23° B.	12 "
Heavy neutral oil, 21° B.	6 "
Reduced stock, lubricating oil, 14° B.	5 "
Asphalt, crude	11 "
Loss	5 "

The extraction of Pyridin bases with dilute sulphuric acid should be done before the redistillation of the distillates, as the treatment of those distillates with concentrated sulphuric acid will otherwise form certain sulpho-conjugated products which, during the washing process with water and alkali, decompose and re-enter into solution again with the refined products.

The special refining methods will be discussed in the next paper, as certain processes are not yet covered by letters patent.

OIL AS FUEL IN LOS ANGELES COUNTY.

By W. L. Watts, Field Assistant.

Oil is largely used for fuel on the Southern California Railroad, a portion of the Santa Fe system, between Barstow and San Diego. More than half of their locomotives are now adapted to the use of oil as fuel. The burners used were invented by W. Booth, formerly Master Mechanic of the Central Railroad, of Piru; the Santa Fe Co. has made some improvements in the original design. Experiments, extending over a period of six months, demonstrated the superiority of oil as compared with solid fuel. An average of the results obtained show that 4 bbls. of oil did the same work as 2,200 lbs. of Nanaimo coal. Experiments extending over sixteen days, with a freight engine, 19″x 28″ cylinders, gave an average evaporation of 13.11 lbs. of water to each pound of coal consumed. Taking coal at $6 65 per 2,000 lbs., and oil at $1 33 per bbl., a money saving of 27.1% is effected. The oil used in this experiment was supplied by the Union Oil Co., and its specific gravity was 23° B. During January, 1896, oil was used as fuel on 25 locomotives, being equally divided between passenger and freight service. The results showed:

Oil consumed by these 25 locomotives during January	2.077 tons.
Distance traveled	87.063 miles.
Average cost per mile	14.39 cents.

The gravity of the oil used was 15° B. During same period coal was used as fuel on 25 locomotives; they performed practically similar work to the engines fired by oil. Average cost per mile, 23.20 cents, or practically a money saving of 37.975% in favor of oil.

During January, 1896, the cost of coal was $6 60 per 2,000 lbs.; at the same date the cost of oil was $6 03 per 2,000 lbs.

During December, 1895, an overland passenger engine, cylinders 19″x 26″, ran 7,347 miles and consumed 143.2 tons of oil. A similar service with coal required 294 tons. Taking oil and coal at the above figures, the relative values are: Cost of oil, $863 50, or 11.75 cents per mile; cost of coal, $1,940 40, or 26.41 cents per mile; practically a money saving of 55.5%. The average of other experiments made, with oil as fuel, was 14.24 cents per mile. In these experiments steam from the boiler was used to atomize the oil and the oil is heated by a steam-coil to a temperature of 100° to 120° F. Two 4″ flat-mouthed burners are used to each engine. The fire-box is protected with fire-bricks and there is an arch of fire-brick at the back of the flues, similar to that in coal-burning locomotives. The Los Angeles Consolidated Electric Railway Co. made a series of careful experiments to test the value of Puente oil as compared with Wellington coal. The results of tests on runs, which averaged 19 hours per day for ten days, showed that 19.41 tons of Wellington coal had a fuel value equal to that of 2,957 gals. of oil of 24° B. The use of oil also saved the labor of five men at $2 a day each. In two of the power-houses the Wilgus steam burner is used and in one the Gilbert & Barker aërated burner. It is said that these burners give practically the same results. Oil is used as fuel in the rolling-mills of the Los Angeles Steel and Iron Co., the Crawford and the Wilgus burners being employed, in which the oil is atomized by steam. The superintendent of this company states that it requires about 1⅔ bbls. of oil to manufacture a long ton of muck bar from scrap iron, and about the same amount of oil to manufacture the muck bar into finished sheet-iron. Thus it takes about 3⅓ bbls. of oil to manufacture one ton of finished sheet-iron from scrap. He also states that, for steam purposes, 3 bbls. of oil equal 2,000 lbs. of good bituminous coal, and that for the heating furnaces, 2½ bbls. of oil equal 2,000 lbs. of bituminous coal; thus, taking coal at $6 65 per ton of 2,000 lbs. and oil at $1 per bbl., the use of oil instead of coal at these works effects a saving, in round figures, of 54.6% for steam purposes, and 62.5% for the heating furnaces.

The court-house at Los Angeles is heated by steam furnished by two boilers at 75 H.P. estimated capacity. Crude oil of 22° to 26° B. is used in Gilbert & Barker's aërated burners for fuel. In these burners the oil is atomized by air. The engineer states that when the boilers are running at their full capacity, 1 gal. of oil will evaporate 15 gals. of water; *i. e.*, practically 1 lb. of oil will evaporate 15 lbs. of water; also, that 1 lb. of good coal would evaporate about 8 lbs. of water in these boilers.

The Los Angeles Pressed Brick and Terra Cotta Co. have five kilns whose capacities range from 20,000 to 40,000 bricks. They use oil as fuel. The manager states that they have tried both steam and air burners, and have concluded that the air burner is the best, on account of its introducing less moisture into the kiln; that, estimating good bituminous coal at $8 per ton, and oil of 30° B. at $1 40 per bbl., the use of oil effects a saving of about 15% in the fuel, and also the labor of one man to each kiln.

At the California Sewer-Pipe Works at Vernon there are three 20′ and two 28′ down-shaft kilns. DeBow steam burners are used. The manager states that the work done with $85 worth of coal, at $7 75 per ton, can be done with $30 worth of oil at 60 cents per barrel. Oil is being used as fuel for open brick kilns by several of the brick manufacturers at Los Angeles. It is said that 1 bbl. of oil is sufficient to burn 1,000 brick, and is therefore equal to ¼ cord of good wood. The price of wood is $6 a cord.

From the foregoing, the relative fuel values of coal and oil are:

L. A. S. & I. Co., heating furnaces	1 ton Wellington coal equals 2.50 bbls. oil.
L. A. S. & I. Co., steam purposes	1 ton Wellington coal equals 3.00 bbls. oil.
L. A. Con. Electric Railway Co.	1 ton Wellington coal equals 3.62 bbls. oil.
L. A. Court-house, steam purposes	1 ton good coal equals 3.10 bbls. oil.
So. Cal. R. R. Co.	1 ton Nanaimo coal equals 4.00 bbls. oil.

Those who have experimented with oils of different specific gravity state that they find very little difference in the actual fuel value of the oil tested, but that oils of a high specific gravity require to be heated in order that they may pass freely through the feed pipes and be readily atomized.

In 1895 there was a prevailing opinion that the oils of high specific gravity had a much less fuel value than the oils of low specific gravity. To determine this point, experiments were conducted in the laboratory of the California State Mining Bureau. Samples of oil varying from

13° B. to 34° B. were burned in oxygen beneath a calorimeter, which had been calibrated with hydrogen, as described in Bulletin No. 3. The samples of heavy oil were cut with gasoline and the calorific value of the gasoline was deducted. The results showed a range of from 9,999 to 10,381 kilo-calories for the samples of oil tested. This was sufficient to demonstrate that there was no great difference in the relative calorific value of the samples tested; but limitations as to time prevented a sufficient number of experiments being made to work out the relative fuel values for the different specific gravities. The samples tested were practically freed from water and other extraneous matter.

It is interesting to note how the theoretical compares with the practical. Taking anthracite coal as a standard, 1 ton of which is equivalent to 8,092 kilo-calories (available heat units) per kilogramme, comparative working tests have shown that an average sample of Nanaimo coal has an available fuel value of 6,684 kilo-calories per kilogramme. Calorimetric tests made in the laboratory of the California State Mining Bureau showed that a sample of Los Angeles oil of 0.973 sp. gr. (equal to 13° B.) had an available fuel value of 10,203 kilo-calories per kilogramme. Practical work on the Southern California Railroad showed that 4 bbls. of petroleum, 15° B. (or 1,352 lbs.), have a fuel value of $1\frac{1}{10}$ tons of Nanaimo coal. As $1\frac{1}{10}$ tons of Nanaimo coal are equivalent to 6,683,332 kilo-calories, therefore 1 ton of petroleum of 15° B. (2,000 lbs.) has a working equivalent of 9,886,585 kilo-calories.

RELATIVE FUEL VALUE.

	Available "Heat Units" in One Kilogramme.	Available "Heat Units" in One Ton, calculated as 909 Kilogrammes.
Nanaimo coal	6,684	6,075,756
Sample of Los Angeles oil, 13° B., calorimetric test in laboratory of California State Mining Bureau	10,203	9,274,527
Sample of petroleum, 15° B., from practical working test on Southern California Railroad, as compared with Nanaimo coal		9,886,585

From the foregoing the following ratios of fuel value have been computed: 1 lb. of oil, per Mining Bureau tests, is equivalent to 1.526 lbs. of Nanaimo coal; 1 lb. of oil, per Southern California Railroad Co.'s tests, is equivalent to 1.629 lbs. of Nanaimo coal.

In a furnace a more complete combustion can be secured with petroleum than it is possible to obtain with coal. Therefore, it is not surprising to find that practical work on the Southern California Railroad gave a somewhat higher fuel value to the petroleum than did the calorimetric tests in the laboratory. Moreover, the samples of petroleum used in the laboratory and on the railroad were dissimilar.

ORE-DEPOSITS WITH ESPECIAL REFERENCE TO THE MOTHER LODE.

By HAROLD W. FAIRBANKS, Ph.D.

Mining has been one of the occupations of man since the dawn of history. As the primitive civilization arose out of the preëxisting condition of savagery, man with his surplus energy and growing esthetic tastes, as well as because of the necessities of exchange, directed his attention toward obtaining the precious metals which accident first led him to discover. Gold has always been considered one of the most valuable of the metals, partly from its beauty and partly from its rarity, and men have been willing to risk life itself in efforts to obtain it.

For ages mining was carried on in the most crude fashion, and it is only within the last quarter of a century that it has been reduced to anything like a science. The old search for a touchstone which could turn everything into gold has been given up, and men have been content to search laboriously for the precious metals, and undertake long courses of experimentation in an endeavor to find the best method to separate them from the gangue and baser metals. Every year witnesses an increase in knowledge and an improvement in methods. The perfection destined to be attained is probably hardly within our comprehension at the present time.

Before taking up a description of the Mother Lode, which will form the main subject of the paper, I wish to say a few words about ore-deposits in general and the conditions governing their formation. As the surface of the globe cooled down from its molten state the various elements assumed positions corresponding to their densities. As we go downward the material of the earth grows more and more dense and contains successively a greater and greater proportion of the metallic elements. This is evident from the fact that the average density of the earth is much greater than that of the surface rocks.

Through the long geological ages the globe has been subject to incessant disturbances with the repeated elevation and depression of vast areas and the erosion and transportation, by the means of atmospheric agencies, of the rocks of the mountains from their elevated positions to the beds of the seas. The surface of the earth is never permanently at rest, and its constituents are constantly undergoing rearrangement in an ever changing manner.

Mountain ranges have always constituted lines of weakness and fracture, and along their axes great bodies of molten rock have been squeezed up from the heated interior, frequently flowing out over the surface and consolidating as lava. Following each period of disturbance and eruption in different mountain regions where ore-deposits have been formed an abundance of springs of hot waters have appeared. These hot waters, which are ever circulating through the deeper-seated portions of the crust and dissolving out various components of the rocks, percolated upward along the fissures followed by the earlier eruptive rocks, or along simple fractures of the earth's crust, and finally deposited their contents in the form which we call veins.

Gold, in common with many of the other minerals, is disseminated in exceedingly small quantities in nearly all rocks of the globe. It is one of the elements in solution in sea water, and with sufficiently refined laboratory apparatus its presence can be detected nearly everywhere. The hot circulating waters play a part in concentrating the gold from the rocks and collecting it in the veins, which might be compared to that of the concentrators in a well-appointed quartz mill which separate the sulphurets from the gangue.

The waters which seep through the rocks reach a depth of several miles, and becoming heated, are thus enabled to dissolve many of the rock constituents and transport them in solution. This we can readily see by the deposits about so many of the numerous mineral springs of California. It is a well-known fact that the solvent power of hot water is much greater than that of cold, and with such minerals as the alkalies already in solution, its power of transformation of the rocks through which it passes is very great. As the heated currents of water become cooler toward the surface, many of the substances held in solution are precipitated along the open spaces in the fissures.

Much speculation has been indulged in concerning the origin of the gold found in veins and how it was placed there, and many curious views have been advanced. An examination of regions where the deposition of minerals is still going on will help us greatly in understanding this question. At Sulphur Creek, in Colusa County, are located some hot springs, in the orifices of which the deposition of gold and quicksilver is taking place at the present time. The openings which have been made there in the course of mining are frequently so hot that it is almost impossible to work in them.

The Comstock mines offer, perhaps, one of the best illustrations of the manner in which gold and silver deposits are formed. Here is a local area in which there has been a succession of igneous rocks through a long period of time. Their formation was accompanied and followed by faulting; that is, fracturing and movement of adjoining portions of the earth's crust. During these movements the rocks were broken and partly ground up, with the formation of more or less open spaces between the fragments. Floods of hot water from deep-seated regions followed the formation of the fissures, and little by little the hot water removed the broken rock and substituted the quartz, sulphides, and precious metals. In order to make room for the enormous ore-bodies which were found here, we must believe that the rock of the walls adjoining the fissures was gradually removed. The view is held by some geologists that the fissures were open and empty before the ore deposition began, being due to the movements of the irregular walls bringing hollows and protuberances opposite each other. However, in most cases the evidence seems favorable to the former view. The formation of the great bodies of gold-bearing quartz along the Mother Lode, which are sometimes massive and sometimes finely ribboned, are inexplicable on the theory of open fissures.

The Comstock deposits are of much more recent age than those of the Mother Lode, and are still in process of formation. In some of the deeper portions of these mines the temperature reaches 170° F., sufficient to scald flesh when immersed in it. It is probable that nowhere else in the world has mining been carried on under such difficulties of this kind. The gold deposits of California rarely show much increase in temperature with depth, and they were either not formed under conditions of such high temperature, or the lapse of time has been sufficient to cool the percolating waters.

Our chief interest at the present time lies with the gold deposits in the Sierra Nevadas, and particularly with the Mother Lode. The careful study which geologists have recently given to this great range of mountains has proved the fallacy of many views formerly held in regard to geology, as well as the occurrence of ore-deposits. Granite used to be considered the primitive crust of the globe and to be the most ancient of all rocks, but in the Sierra Nevadas, where it is so extensively developed, it appears to be comparatively recent, geologically speaking. In the older text-books on the subject of ore-deposits it is stated that gold in particular was formed in the most remote geological times. Careful observation has shown, on the contrary, that its deposition is still going on in localities where the conditions are favorable. The geological processes which have been at work modeling and remodeling the outer surface of the globe, as well as those deep-seated chemical and physical forces, have never ceased for a moment, and are still constantly at work, as any careful observer can readily perceive. We are living on a portion of the globe where the mighty energies within are comparatively quiescent at the present time, but we do not know how long this will last.

The Sierra Nevada is not an ancient range of mountains, geologically considered. During the earlier periods water covered the most of the region now occupied by that mountain range. At the close of the geological period which we call the Jurassic, there was an unparalleled disturbance along eastern California: the bed of the sea was uplifted, the strata folded together, and involved in an enormous body of molten granite. After this had cooled, and following the formation of an extensive system of faulting, which we notice occasionally even to-day, in the shape of earthquake shocks, the gold-bearing quartz veins were formed. In all probability they were due to the agency of warm springs, whose number as well as volume must have been enormous.

At this time the Sierras was a high and rugged range, perhaps more elevated than at present. Through long ages the action of atmospheric agencies was exerted upon the mountains. Rain and frost disintegrated the rocks, and the rushing rivers carried the detritus down to the valleys. In this manner the mountains were gradually reduced to a level much below the present. The cañons widened to valleys and the high peaks slowly wasted away until the great range of mountains was reduced to a comparatively low, gently sloping elevation. While the most of the detritus had been transported to the Sacramento and San Joaquin valleys during the earlier period of erosion, much of the coarser material gathered toward the last in the broad beds of the sluggish streams. During this process of erosion the numerous quartz veins were, of course, also broken up and the freed gold, having so high a specific gravity, collected in the beds of these rivers. The remnants of those ancient streams we recognize to-day as the "auriferous gravel channels." They owe their richness to the enormous amount of erosion which had taken place, an amount equal to a layer of rock several thousand feet in thickness.

After the auriferous channels were filled disturbances began to take place on the higher parts of the mountains, and streams of molten lava flowed down the beds of some of the rivers, while in others volcanic ash and bowlders of lava were brought down by the water. In this manner the auriferous gravel channels were buried by what we call the "lava cap." Our study of the mountains has shown that these lava-flows were brought about by the formation of a fault line along the eastern side of the Sierras, accompanied by the gradual elevation of the range. As the mountains kept rising there was an increase in the rainfall, and the streams again began to cut into their beds. Owing to the hardness of the lava cap, new channels were generally formed by the side of the ancient ones. The streams everywhere made use of the lowest depressions and the most easily eroded surfaces, until to-day we see the result in the cañons of the present streams, which are often one to two thousand feet deep. They cross and recross the ancient gravel channels or flow by their sides.

Gold-bearing quartz veins are found in the mountainous portions of nearly the whole State of California. They occur in association with all the different kinds of metamorphic and eruptive rocks, but are particularly abundant in what has been termed the "auriferous slate" or "bedrock series." With one or two exceptions they are not found in the formations later than the Jurassic, a fact which the study of geology has brought out, and which should be borne in mind in prospecting, particularly in the Coast Range.

Of all the many districts in the State, interest has centered most about the great mineral belt known as the Mother Lode. So great has been and is still the charm of this name, that people have sometimes refused to look at mines which were not on the Mother Lode, while all mines thus located have often been considered valuable by those not familiar with the actual conditions.

Let us see first what is meant by the term Mother Lode. So various have been the applications of the name that it is rather difficult to form a definition which shall please everybody. By many it has been held to embrace the whole of the mineral belt lying along the western slope of the Sierra Nevadas, and some have even extended it into Mexico on the south and British Columbia on the north.

If we examine a geological map of the Sierra Nevadas we shall see that, beginning in Mariposa County and extending northward until covered by the volcanic rocks in Plumas County, there is a widening belt of slates with associated dikes of eruptive rocks, which have been referred to before as the bedrock series. Gold-bearing quartz veins occur over much of this area, and an examination reveals the fact that through some of the distance they can be separated into three general divisions: the lower, the middle, and the upper belts. The middle one is the most regular and continuous, and by far the most productive through the most of the counties on the western slope of the Sierras. It is the one on which custom is almost unanimous in bestowing the term Mother Lode.

The Mother Lode might be defined, then, as a mineralized zone of varying width, sometimes reaching over a mile, and extending continuously through the counties of Mariposa, Tuolumne, Calaveras, Amador, El Dorado, and possibly farther north. Through a portion of this distance it is characterized by the presence of one main fissure of remarkable proportions, while in other places, where the conditions were different, it consists of a number of parallel fissures occupied by quartz veins. The lode is associated with a narrow and almost continuous belt of black slate, called the Mariposa beds, while the veins occur either in the slate or on the contact between it and the diabase dikes, which are known among the miners as "greenstone."

The remarkable regularity and continuity of the fissures of the Mother Lode are due in great part to the geological structure. This regularity in structure has been caused by the fact that the slates have not been crushed and broken, but uniformly tilted at a steep angle when the mountains were first formed. The bedding planes of the slates, as well as the contact between them and the eruptive dikes, offer lines of weakness subject to movement, and along these lines the mineral-bearing solutions have carried on their work.

As far as can be learned, the term Mother Lode was first applied to the veins worked at Nashville, 12 miles south of Placerville, in the latter part of 1850 or the early part of 1851. In the use of the term Mother Lode it is not intended to convey the idea of a genetic relation to other lodes or veins, although it is likely that from the size, extent, and richness of this series of veins, the early miners first used the expression partly with this significance, and partly, perhaps, meaning the source from which came the great wealth of the surface placers.

The magnitude of the operations along the Mother Lode gold belt since the earliest days of mining in California, and the importance of a thorough knowledge of the occurrence of its ores, are best illustrated by the fact that over the whole length of the lode, a distance of more than one hundred miles, there is an almost continuous series of mineral locations, comprising more than five hundred patented claims and as many more unpatented ones.

The lode follows in a general way the northwest and southeast trend of the mountains, the veins conforming, as a usual thing, to the course of the stratification of the inclosing rocks, with a dip of 40° to 75°. None of the other belts begin to compare in extent or regularity with the Mother Lode. A peculiar feature of many portions of the lode is the presence of a green vein matter, called mariposite. This is associated with the carbonates of lime, magnesia, and iron. The large amount of iron is the cause of the red croppings, over which one can sometimes walk almost continuously for many miles.

As an example of the magnitude which the Mother Lode sometimes assumes, Quartz Mountain, Calaveras County, affords a good illustration. The mountain is about 600′ wide, nearly half a mile long, and 250′ high. It is composed wholly of quartz and vein matter, the latter consisting of mariposite and dolomitic material. In the middle, and forming the summit, is a great body of massive quartz. On the west side is another vein of quartz nearly as large, and on the east a smaller one. The vein matter between the larger quartz veins is completely filled with a network of small veins.

The greatest exposure of quartz is on the Mariposa Grant, in Bear Valley, Mariposa County. It is 20′ thick at the base, 150′ long, and rises 80′, with a dip of 70°.

In Mariposa County the lode is characterized by two main veins: first, the one extending north from Princeton through Bear Valley and along the Merced River, constituting the west vein at Coulterville. The other, beginning north of the Merced River, outcrops almost continuously through Coulterville to Moccasin Creek. From there the fissure continues into Tuolumne County, although containing but little quartz for a number of miles. The lode is widest at Quartz Mountain, and here, as well as north and south for several miles, there are two or more parallel veins. The country rock adjoining the veins on either side is filled with small pocket veins much of the distance through Tuolumne County.

In Calaveras County the lode is most prominently exposed at Carson Hill, Angels Camp, and in the vicinity of the Mokelumne River. The largest nugget ever found in the State was obtained from a shaft on the summit of Carson Hill. Through central Calaveras County the slates do not lie in the direct course of the lode, and the latter is considerably scattered. The slates, however, are again encountered on the course of the lode at the Gwin Mine, and it follows them into Amador County.

Through Amador County the lode is nowhere confined to a single vein, but consists of a series of them, occupying a width of nearly a mile in many places. The numerous veins through this county are probably due to the many parallel dikes of greenstone inclosed within the slates.

In El Dorado County the veins are also scattered through the black slates, although the main vein is often found near the eastern edge. West of Placerville, the slates are cut by large bodies of eruptives for several miles, and while the course of the main lode is clearly marked it is not sharply distinguished from the broad mineral belt below.

The veins of the lode almost invariably dip a few degrees less than the inclosing rocks, and it is usual to find the foot-wall rocks, especially when they consist of slate, bent away from the normal dip, corresponding to that of the vein; hence it is probable that the hanging-wall has been pushed up. If this is the case it would indicate an upward strain along the mountain range which tended to relieve itself in the fissures of the lode.

That the lode is a true fissure is amply proved by the universal presence of gouge seams. The movement of the walls of some of the fissures has been immense. This is made easy because of their length. The great width of the ground-up wall rocks, sometimes reaching 30′, indicates a long continuance of the movement, probably more or less oscillatory, with a general rise of the hanging-wall. The greatest depth to which the lode has been opened, about 2,200′, shows no weakening of the veins or deterioration of the ore. It is not likely that any high degree of heat will be encountered at any depth that can be reached in the ordinary course of mining, for as yet it is not noticeable.

The depth to which gold-bearing veins extend is an open question, and probably differs in different localities. It is probable that they will be found to hold out along the Mother Lode to the greatest depths at which the expense of handling the ore will permit them to be worked. They may extend to those depths at which the pressure is so great that the rocks move through plasticity rather than through faulting.

In studying the occurrence of gold and its ores along the Mother Lode, no relation has yet been found to exist between the character of the walls and the poverty or richness of the quartz. It is recognized that a vein lying at the contact of two different formations is more regular and the mineral contents more evenly distributed than one lying in a formation which does not easily afford a regularly defined fissure.

I do not believe that in the case of the Mother Lode the mineral character of the walls has influenced the deposit; that is, in the sense of the mineral contents having been derived directly from them. The mines of the lode are equally rich whether in slate, or at the contact of the slate with the greenstone, or in any of the rocks which occur. Good mines as well as poor mines can be found under any of these conditions. I do not think that any combination of wall-rocks will insure a rich vein, but that the deposit of the metallic particles is dependent more upon certain chemical reactions taking place in the solutions circulating in the fissure. This is proved by the fact that of two veins lying side by side in the same mine, one may be barren, and the other constitute the pay-rock. The rock which constitutes the walls on the surface, or at any depth which can be reached, is no indication whatever of the character of the deep-seated portions of the crust from which the circulating fluids abstracted their mineral contents. The real conditions are certainly complex, differing greatly in different localities. The same character of ore is rich in one place and poor in another, without any apparent reason for it. Any one mining district is apt to be characterized by certain peculiarities, and a study of these is the best guide to go by in that district, but they may be misleading in another.

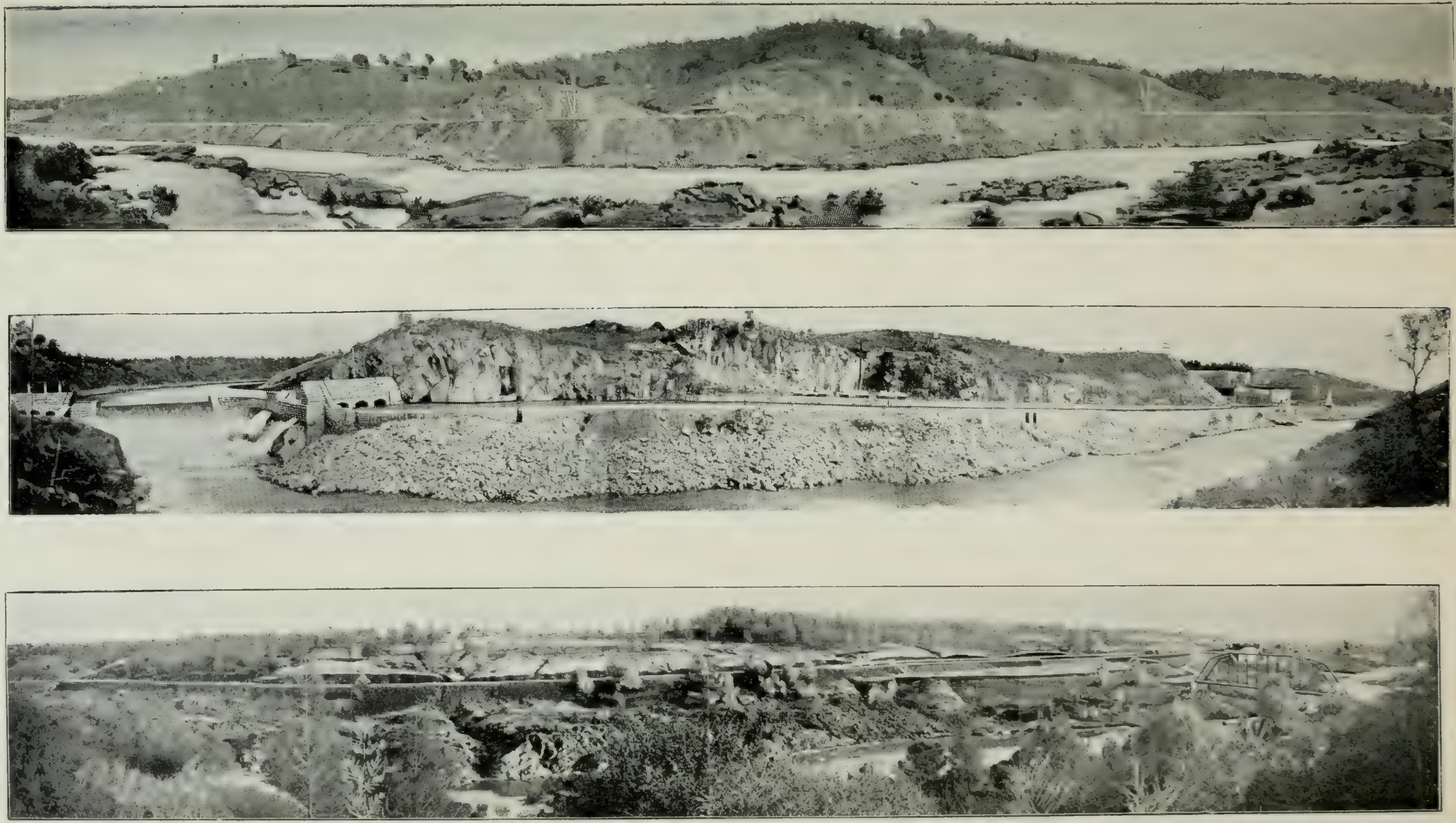
An erroneous idea common among prospectors is that a vein should improve as depth increases. As a matter of fact veins are very irregular, both in depth and lateral extent. They pinch to mere seams and then swell to a width of many feet. These changes take place without any system, and are due to the very irregular manner in which the wall material has been removed by the mineral solutions, or possibly in some cases to the movements of the walls bringing two protuberances or two depressions together.

It must be clearly borne in mind that the present surface of the western slope of the Sierra Nevadas was not the surface at the time of the formation of the gold-bearing veins. Since that period several thousand feet in depth of the rock with the inclosing quartz veins have been worn away. Consequently, it is a mere accident what portion of the vein is at present exposed on the surface. As all veins swell and pinch, having shoots of ore between which are barren places, erosion may have left on the surface merely the lower end of a shoot, which might be exhausted in less than a hundred feet; or it may equally well have merely exposed the upper end of such a shoot. In the former case the vein would grow smaller or poorer, and soon a barren stretch be reached which might be nothing more than a seam of clay or broken rock. In the instance where erosion has just exposed the upper end of a shoot the phenomena observed in opening the mine would seem to support the view that veins grow richer in depth. In the case of the veins which soon pinch out a little perseverance would in most cases be rewarded by again meeting the ore-body. This condition of things has often been illustrated along the Mother Lode. Many mines have been abandoned because it was supposed that the vein had given out. Some of these mines have been reopened later, and with more careful exploitation have been found to be valuable still. A thorough knowledge of the occurrence of ore-deposits would have prevented a large number of these failures.

Many failures also occur in mining because of a lack of a thorough study of the kind of treatment which the particular ore requires in order to save the gold. As many failures have occurred, probably, for this reason as for any other.

There is a change of importance in the character of the ore of many mines as the depth increases, which is frequently overlooked in determining the kind of mill to erect. The upper portions of most ore-deposits are more or less completely oxidized, leaving the gold in a free state—that is, uncombined with other metals—while below the oxidized zone, which varies in depth in different places, its condition is different. The depth of the alteration is conditioned by the extent to which the deposit has been affected by atmospheric agencies. Below this line of oxidization, which is sometimes called the water-line, the precious metals are often wholly or in part combined chemically with base metals from which they have to be separated by either roasting and chlorination or by the cyanide process. Along the Mother Lode much of the gold is found in the free state at the greatest depths reached, but in other portions of California there is often very little free gold to be found after getting down a few hundred feet.

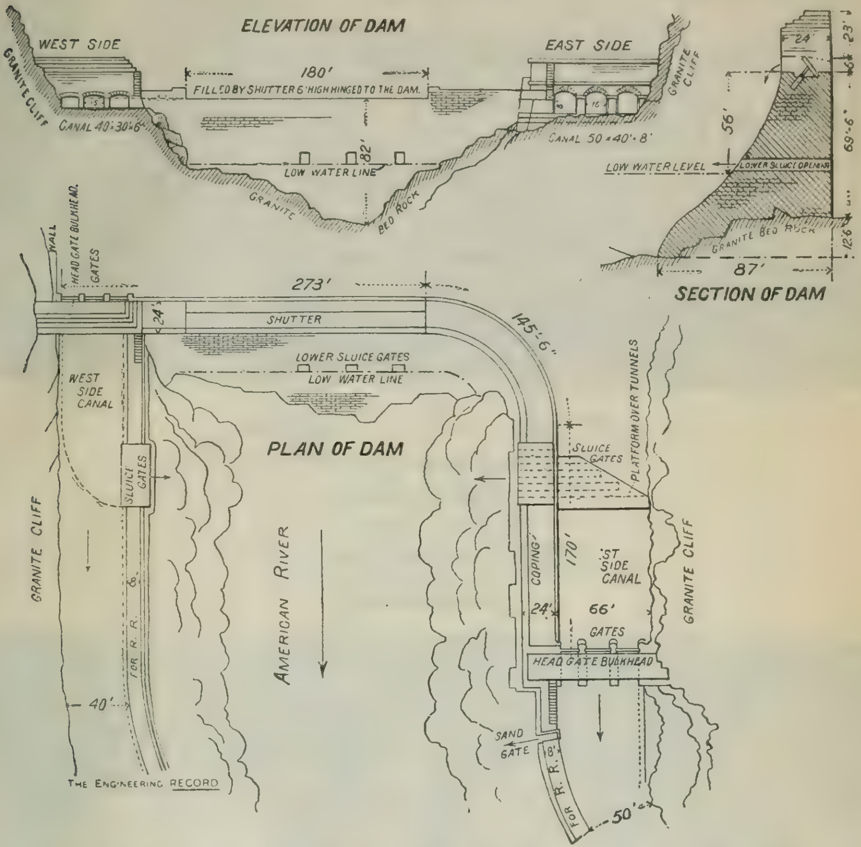
There is, without doubt, no such series of gold-bearing veins as those constituting the Mother Lode to be found elsewhere in the world. While the number of patented mines already exceeds five hundred, mining here is yet in its infancy. With more careful exploitation and better means of saving the gold, many more mines can undoubtedly be operated. Wildcat speculation has had and is still having, to some extent, a baneful effect upon the industry. Many people have come to look with suspicion upon all mining ventures because of the number of failures. It is believed that the time is coming when mining will be considered as legitimate a business as any other, and that it will demand less risk for the investment of money than is required in many other pursuits.



Panoramic View of the Dam and Canal of the Sacramento Electric Power and Light Company.

ELECTRIC-POWER TRANSMISSION PLANTS IN CALIFORNIA.

By W. F. C. Hasson.



Outline Plan of Dam and Headworks of the Sacramento Electric Power and Light Company.

During the past two years the development of water-power in California, and its electric transmission, has rapidly advanced.

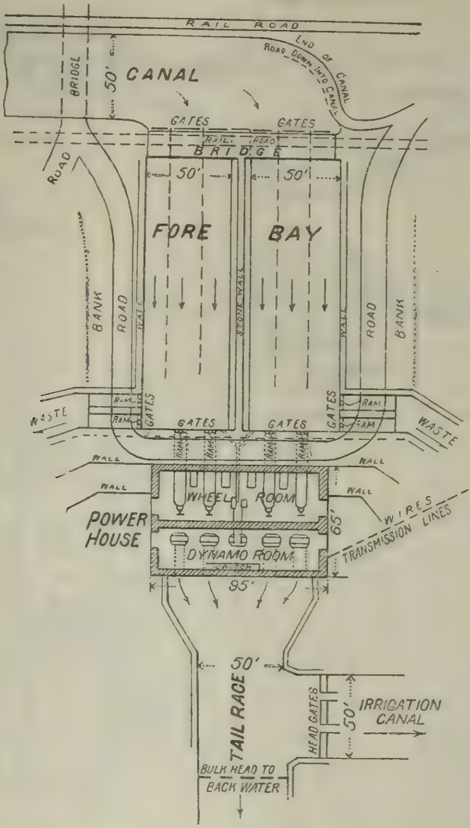
SACRAMENTO ELECTRIC POWER AND LIGHT COMPANY.

The most extensive plant installed is that of the Sacramento Electric Power and Light Company, at Folsom, California. This plant consists of four 750 K.W. three-phase alternating-current generators, driven by four sets of 30″ McCormick turbines, each having a capacity of 1,260 H.P. The generating E. M. F. is 800 volts, and the current is then transformed to 11,000 volts for transmission to the sub-station at Sacramento, a distance of 22.75 miles. At the sub-station are three 250 H.P. synchronous motors which drive a counter-shaft, to which are belted four direct-current generators supplying a 500-volt current for railway purposes, and five arc-lights machines. From this sub-station the following classes of current are distributed, distances ranging as high as 5 miles:

(*a*) 500-volt direct current for railway purposes;

(*b*) 500-volt alternating current for motor purposes;

(*c*) 200-volt alternating current four-wire system for incandescent lighting purposes in the center of the city;



Outline Plan of Canal, Fore-bay, Power-House, and Tail Race at Folsom.

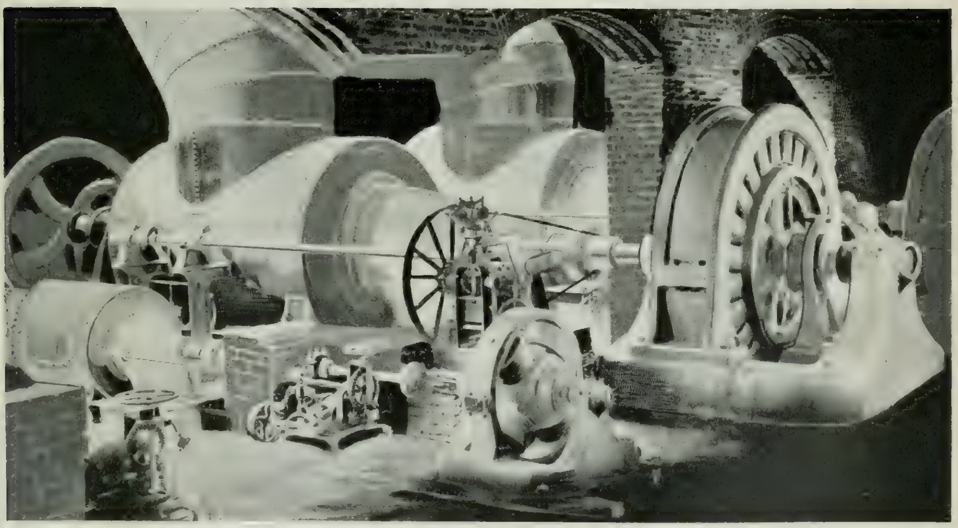
(*d*) 1,000-volt alternating current for incandescent lighting in the outlying districts.

The machinery was started July 14, 1895, and is now supplying current for operating the following:

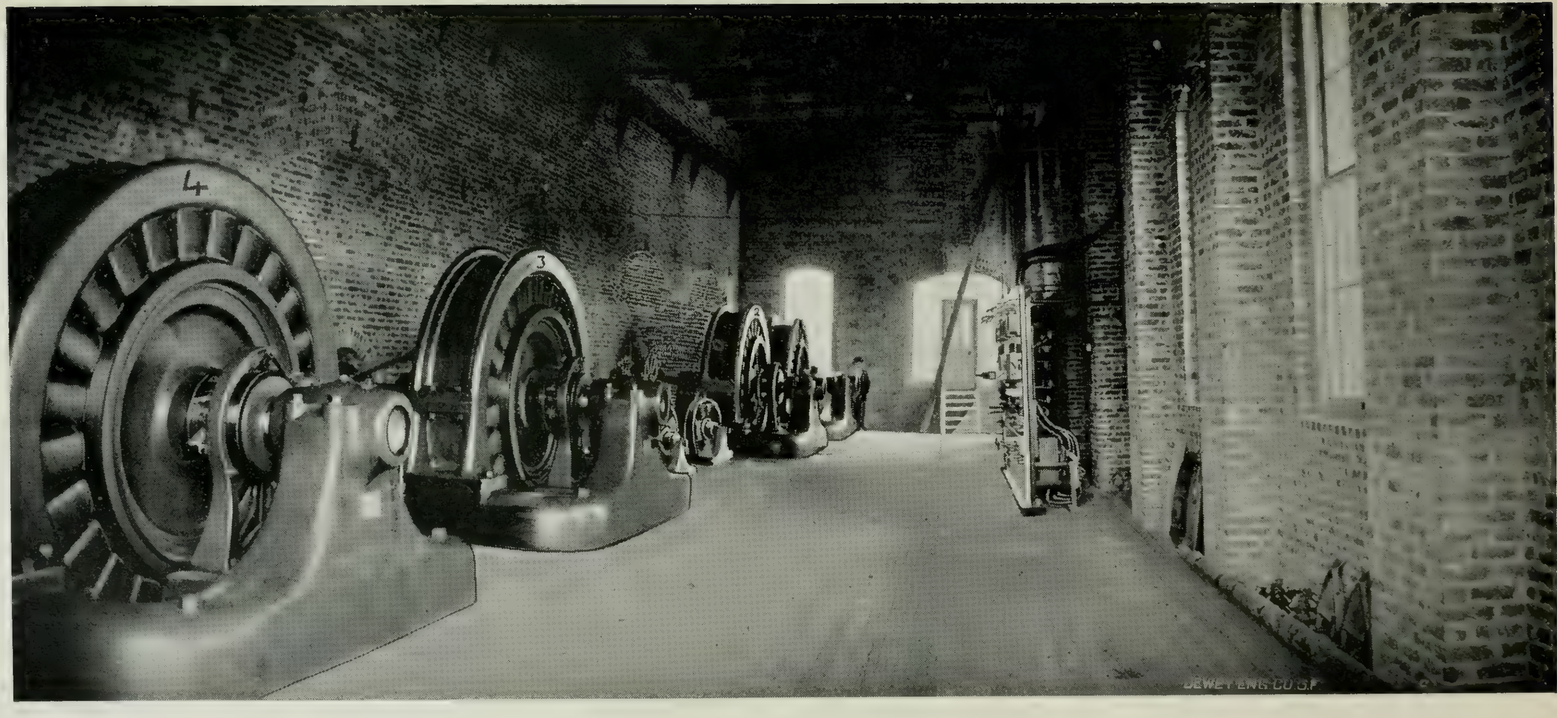
Incandescent lights	12,662
Public arc lamps	234
Private arc lamps	348
Alternating-current motors	537 H.P.

Also, the entire street railway system of Sacramento, which has 24½ miles of single track and 17 miles of double track, and operates from 22 to 35 cars. In addition to this, motors aggregating in capacity 200 H.P. are now being installed.

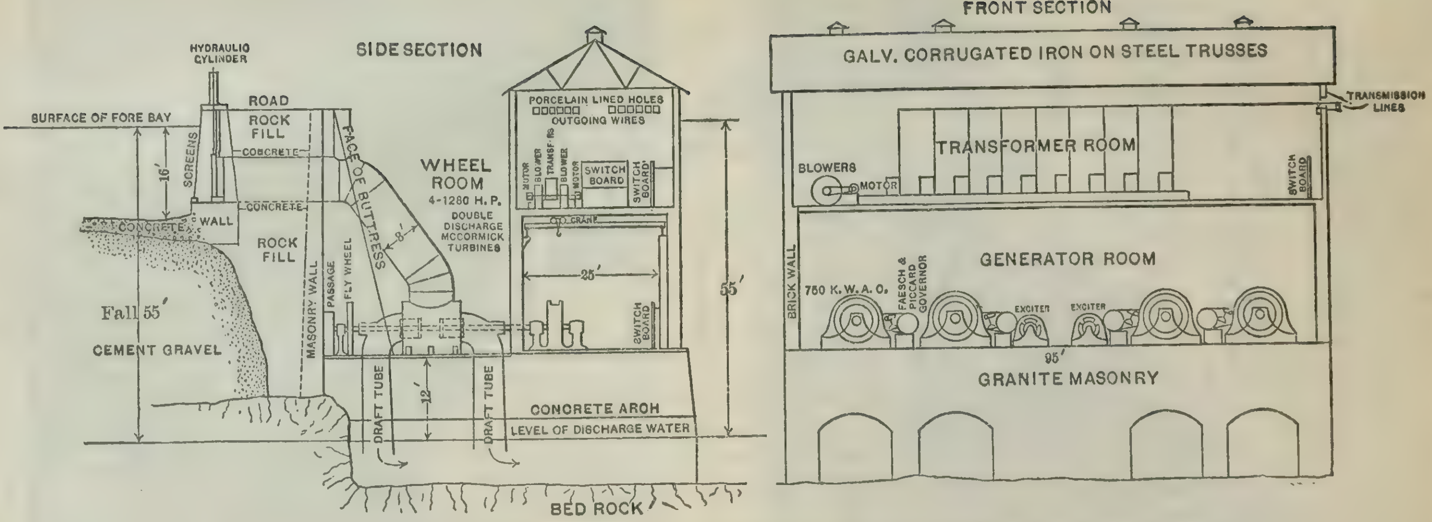
State Power-House Across Canal at Represa.



Sectional View Showing Connection of Turbines, Generators, Water-wheel Governors, and Exciters at the Folsom Power-House.



Generator-Room of the Power-House at Folsom.



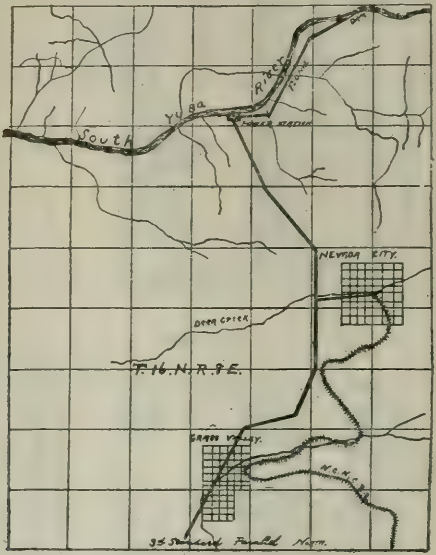
Sectional Outlines of Fore-bay, Hydraulic and Electric Plants, at the Folsom Power-House.

The power supplied is utilized for a great variety of purposes, such as running the machine shops of the Southern Pacific Railroad Company, breweries, printing offices, flour mills, and elevators.

Great care was taken, in designing this plant, to adopt all precautions to secure a permanent operation essential to supplying power for multifarious purposes in the city.

The transmission line from Folsom to Sacramento consists of a double-pole line of carefully selected Washington cedar poles, 40′ in length and measuring 16″ at the butt.

The class of work is such as to develop all the serious difficulties of regulation arising in the utilization of water-power. Much experimenting has been done to perfect the regulation, and the work now being done shows that this has been fairly accomplished.



Section of Country Supplied by the Nevada County Electric Power Company.

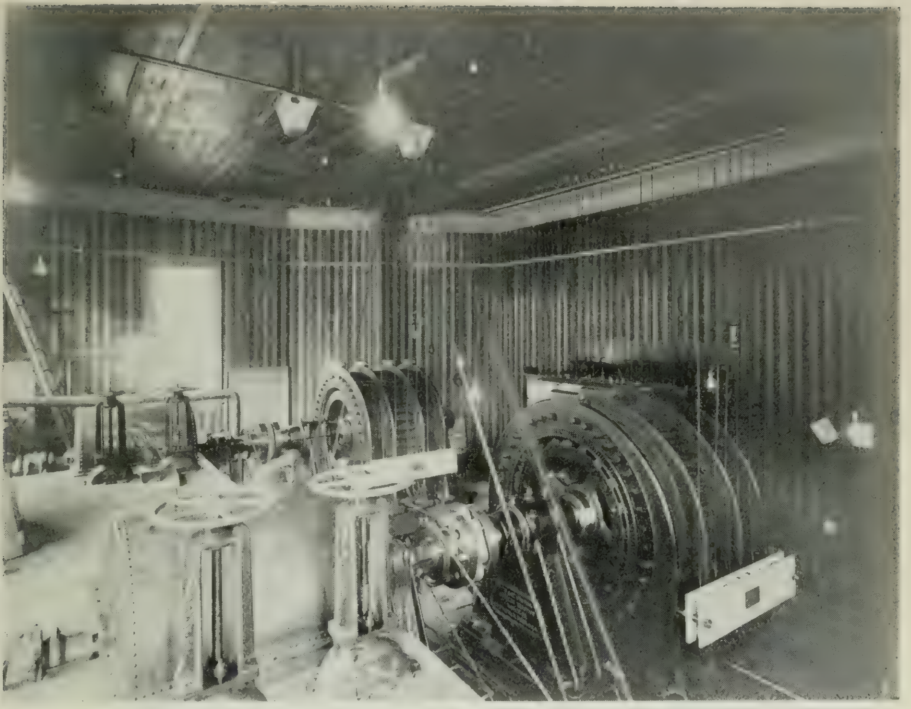
NEVADA COUNTY ELECTRIC POWER COMPANY.

Several years ago, an effort was made to construct a dam in the South Yuba River, with the idea of utilizing the water-power. During the past year, a log-cribbed dam, 32′ high and 206′ in length on the crest, has been constructed, and the water thus diverted is carried in flumes a distance of 3½ miles, until a head of 206′ is obtained. At this point have been installed two alternating-current Stanley generators having a capacity of 340 K.W., directly connected to, and driven by, two Pelton water-wheels, each having a capacity of 500 H.P. These dynamos generate current directly at a potential of 5,500 volts.

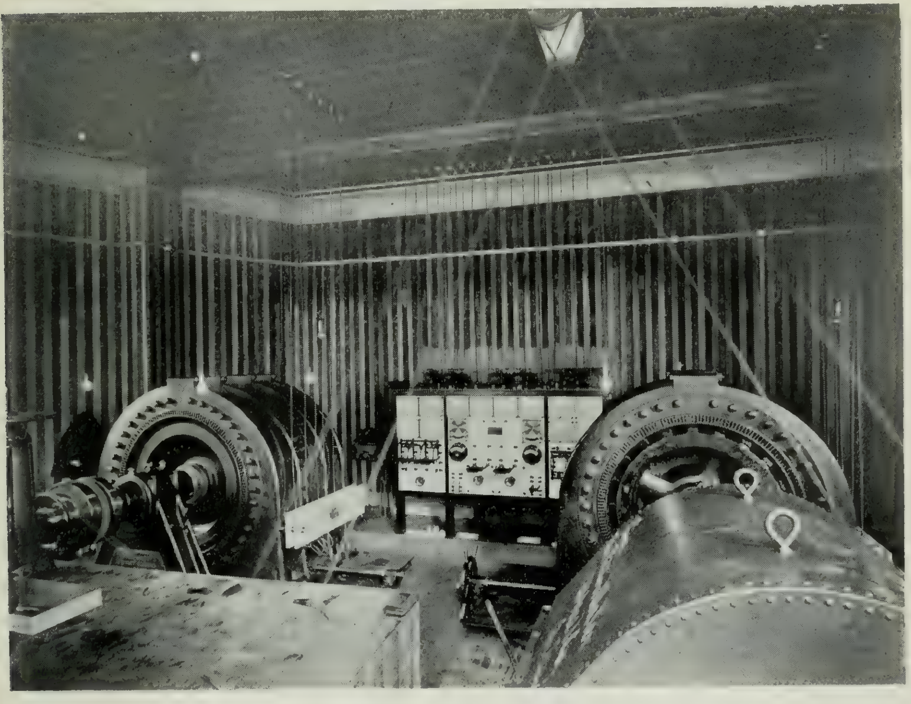
The current thus generated is transmitted 4 miles to Nevada City, and thence 4 miles to Grass Valley, where it is used to supply all the public and private lights and the small demands for power. Diverging lines are carried to the mining districts, and power is now being supplied to the Red Hill Mine for one 30 H.P. motor, and to the Gold Hill Mine for one 160 H.P. motor. This latter drives an air-compressor,

Power-House, Nevada County Electric Company.

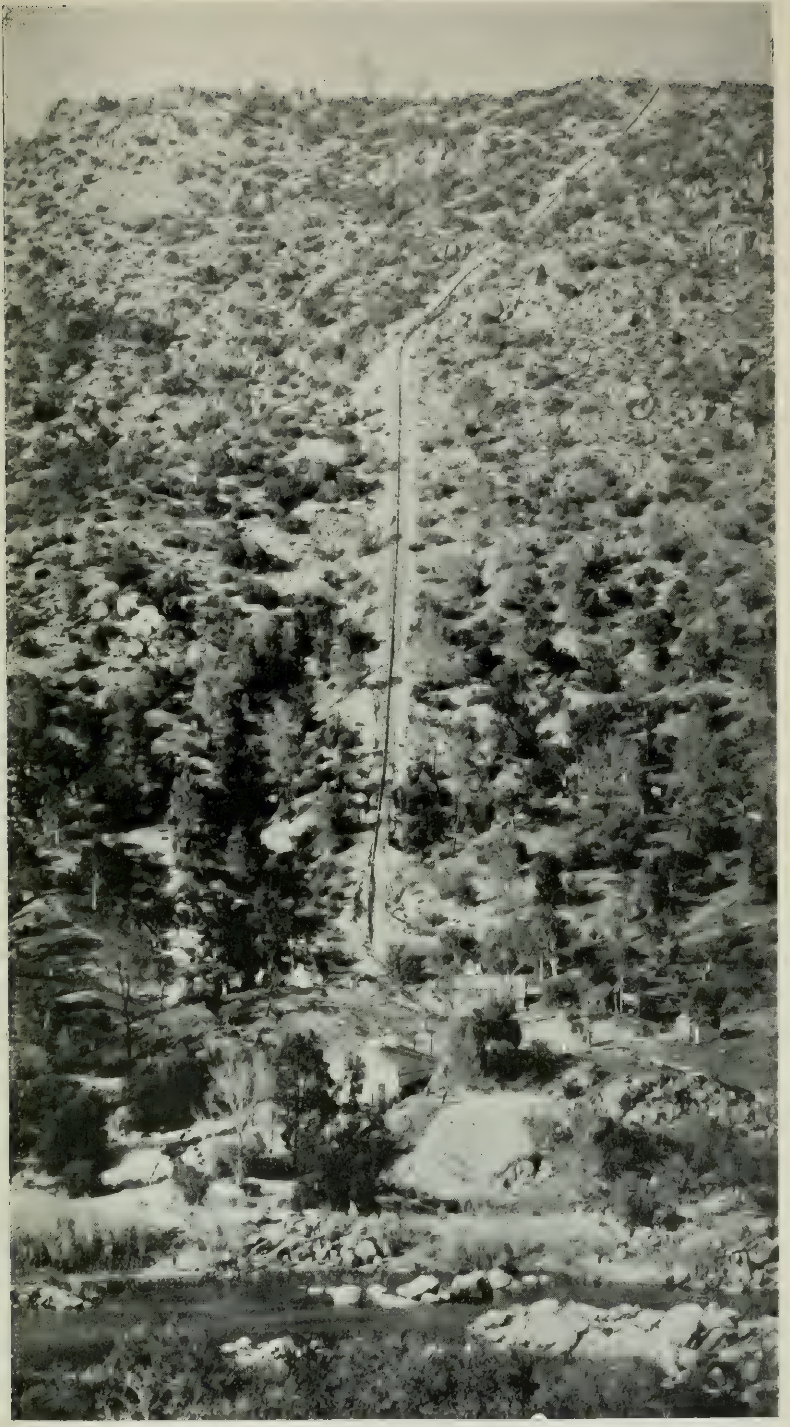
Dam in Yuba River, Nevada County Electric Company.



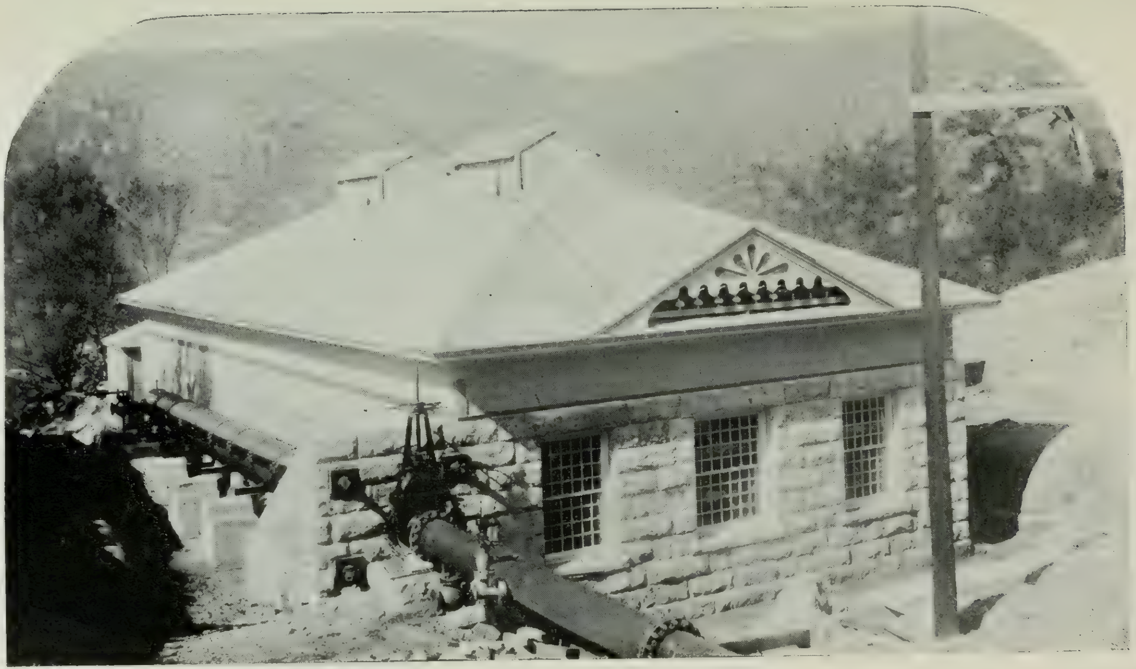
Interior of Power-House, Nevada County Electric Company.



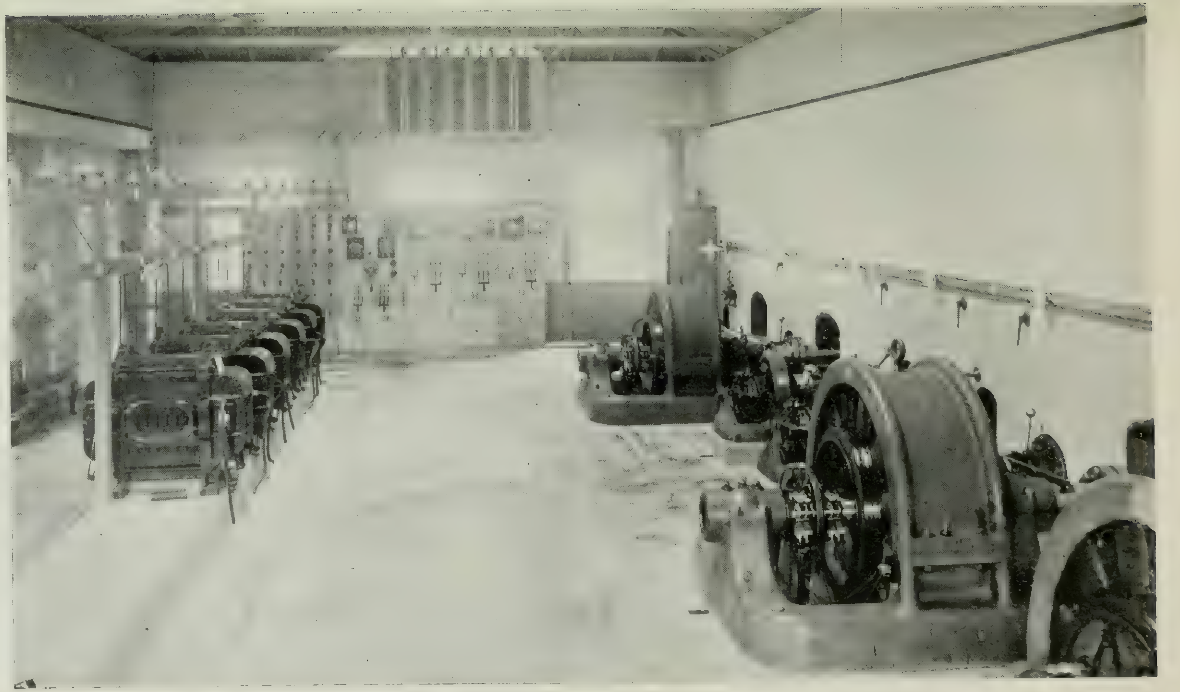
Interior of Power-House, Nevada County Electric Company.



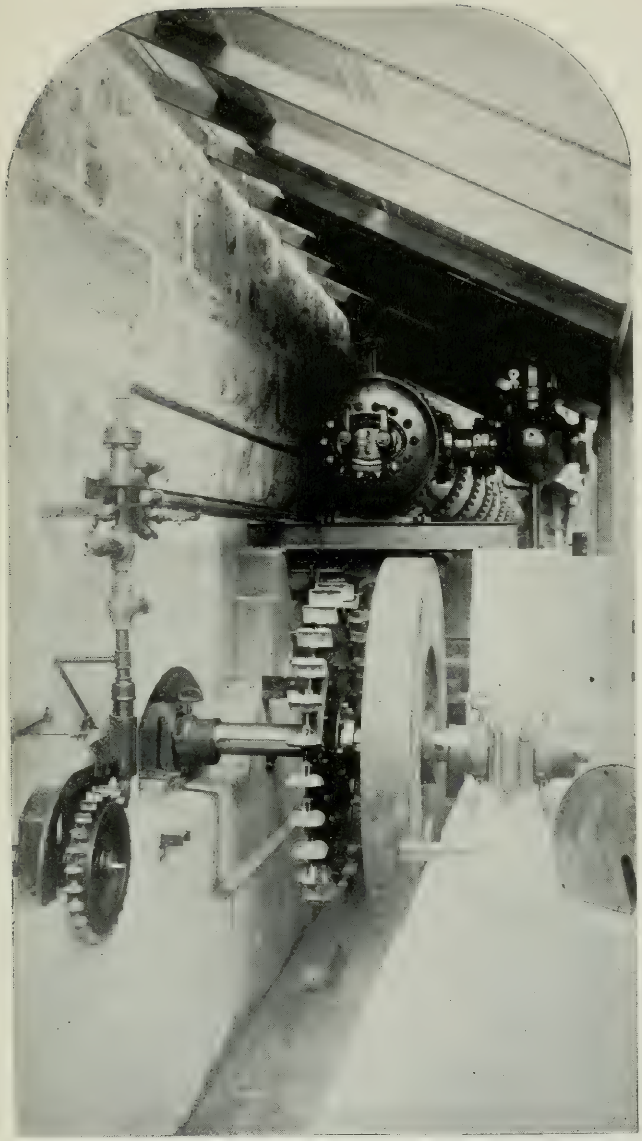
View of Reservoir Mountain, Pipe-Line, and Power-House of the San Joaquin Electric Company



Power-House of San Joaquin Electric Company, Showing Mode of Withstanding the End-Thrust of Pipe-Line.



INTERIOR VIEW OF POWER-HOUSE OF THE SAN JOAQUIN ELECTRIC COMPANY.



Water-Wheel Mountings, Showing Fly-Wheel, Exciter, and Lower End of Receiver, San Joaquin Electric Co.

which, in turn, operates the pumps, hoists, and other parts of the mining machinery.

Work on this plant was commenced about June 1, 1895, and the machinery was started on February 4, 1896, since which time it has been in continuous successful operation.

This plant is of great importance in that, due to the high price of fuel, many mines in this famous mining region have been shut down for lack of a cheap power. Interest in mines has been revived, and old mines that are known to be of excellent value are now being reopened.

SAN JOAQUIN ELECTRIC COMPANY.

This plant consists of three 360 K. W. general electric three-phase generators, driven by Pelton water-wheels. The power is transmitted at a potential of 10,000 volts, a distance of 35 miles to Fresno, where, although the plant has been in operation but a short time, it already supplies power for a variety of purposes; such as—

Flour-mill	180 H.P.
Water company, for pumping purposes	75 H.P.
Arc lights	120 H.P.
Planing-mill	30 H.P.
Elevators, printing offices, feed-mills, packing-houses, etc.; various small motors, aggregating	65 H.P.
About 3,000 incandescent lights.	

POWER DEVELOPMENT COMPANY.

This company is now installing two 450 K. W. general electric three-phase generators, to be driven by Girard water-wheels, and transmitting power, at a line potential of 10,000 volts, a distance of 16 miles to Bakersfield. The power will be used for multifarious purposes, but largely for pumping water for irrigation. The plant will be completed within a few weeks.

TUOLUMNE COUNTY ELECTRIC LIGHT AND POWER COMPANY.

This company has installed one 150 K. W. general electric three-phase generator, driven by a Pelton water-wheel. The power thus generated is transmitted, at a line potential of 10,000 volts, a distance of 12 miles to the Rawhide Mine and a marble mill, where it is used for driving hoists, stamps, rock-breakers, and other motors. It is the intention of the company shortly to double the capacity of its generating plant.

SPRING CREEK ELECTRIC POWER COMPANY.

This company has installed two 100 K. W. general electric three-phase generators, driven by Pelton water-wheels. The power is transmitted, at a line potential of 2,080 volts, distances ranging from 1½ to 5 miles in the vicinity of Redding, California, where, in addition to supplying power for incandescent lighting, it supplies the Texas Consolidated Gold Mining Co. with power for motors for running stamps, rock-breaker, and hoist.

In addition to the above, the following machines have been, or are being installed by the WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, and are in all cases driven by water-power and Pelton water-wheels:

Gwin Mining Development Co.
  One 7½ K.W. 125-volt generator for lighting mill.

Cons. Golden Gate Mining Co.
  One 7½ K.W. 125-volt generator for lighting mill.

Plymouth Rock Mine.
  One 3¾ K.W. lighting generator.

B. E. Letang, Jackson, Cal.
  One 30 K.W. single-phase 1,100-volt alternator.

Oroville Gas, Electric Light, and Power Co., Oroville.
  One 60 K.W. single-phase, 2,200-volt alternator.

Big Creek Power Co., Santa Cruz, Cal.
  Two 150 K.W two-phase generators. Distance of transmission, 18 miles; potential of line, 10,000 volts. Used for power and lighting in Santa Cruz.

Santa Ysabel Gold Mining Co., Quartz Mountain, Cal.
  Two 60 K.W. 500-volt generators. Used for operating several hoists. Distance of transmission, 2,000′ to 4,000′.

Central California Electric Co., Auburn, Cal.
  Two 400 K.W. two-phase generators. Line potential, 15,000 volts. Distance of transmission, 30 miles. Objective point, Sacramento.

Utica Mine, Angel's Camp, Cal.
  One 150 K.W. 2,500-volt single-phase alternator. Distance of transmission, 8 miles.

Stanislaus Milling and Power Co., Knight's Ferry, Cal.
  One 37½ K.W. alternator. Distance of transmission, 13 miles. Potential of line, 5,000 volts.

Watsonville Electric Light Co., Watsonville, Cal.
  Two 45 K.W. two-phase alternators. Distance of transmission, about 2 miles. Potential of generators, 2,200 volts.

Fort Jones, Cal.
  One 45 K.W. two-phase generator. Distance of transmission, about 1 mile. Potential, 2,200 volts.

Redding Electric Light Co., Redding, Cal.
  One 75 K.W. 2,200-volt, single-phase alternator. Used for lighting purposes.

Pasadena & Mount Wilson Railway Co., Pasadena, Cal.
  One 30 K.W. alternating-current generator. Potential, 2,000 volts.

Thorough investigations have been made of the Kern, San Gabriel, Stanislaus, Pitt, and McCloud rivers, with a view of determining the feasibility of utilizing them for water-power. The development of these powers now depends only upon the procuring of the necessary capital, and the development of permanent markets.

The average cost for the transmission plants ranging from 13 to 25 miles, when the capacity of the plant is greater than 1,000 horse-power, ranges from $100 to $140 per horse-power.

The fixed charges for maintenance and operation range from $13 50 to $30 per horse-power per annum.

SAN FRANCISCO, September 12, 1896.

THE SAMPLING AND MEASUREMENT OF ORE-BODIES IN MINE EXAMINATIONS.

By Edmund B. Kirby.

Read at meeting of the Colorado Scientific Society, December 3, 1894.

Investors who contemplate the purchase of mining property, or who have to decide some question of business policy concerning property they already own, are frequently unable to judge of such enterprises, or lack the time to investigate for themselves. It is then customary to call in the aid of some experienced mining engineer, in whose judgment and integrity absolute reliance is placed. Such men, who make a specialty of mine examinations, now constitute a large class of the engineering profession, and are commonly known as "mining experts."

The work is peculiar in that the engineer is generally called upon, not merely for his opinion on technical points, but as the judge of the investment. This makes the responsibility unusually heavy, since his decision is generally accepted as final, and the amounts involved are large.

THE SCOPE OF EXAMINATIONS.

The examination of a mining property necessitates an inquiry into everything that bears upon its value as an investment. Among the principal facts to be determined are: the net value of ore already discovered, the chances indicated for further discoveries, the best metallurgical treatment, and the past record of the property. Estimates are required of operating expenses, costs of development, equipment, etc., together with the profit to be expected. The price and terms of payment, the working capital needed, and the time required for its recovery, the question of title, the risks from litigation, flooding, and other accidents, also enter the problem.

After these and all other pertinent facts have been carefully determined and arranged clearly before the mind, the main question at issue, of investment or policy, is decided by that business judgment which comes only from experience and knows no set rules or formulæ.

ESTIMATES OF DISCOVERED ORE AND THEIR RELATIVE IMPORTANCE.

It is the object of this paper to discuss only one part of the work thus outlined: the valuation of discovered ore by sampling and measurement. This has little or no importance in some cases, either because no ore has yet been found, or its quantity is small, or other matters are sufficient to decide the question of investment. In other mines the amount of discovered ore is one of the chief considerations, and requires an accurate estimate. This is a difficult and laborious undertaking, often calling for every resource of technical skill. But little has been published upon the subject in professional literature, and every engineer has selected or evolved his own methods, generally with little knowledge of, or reference to, those of others. It is therefore intended to describe the methods which the writer has found most effective, in the hope that others engaged in the same field may also contribute to this important subject.

TERMS DEFINED.

It is desirable to first define the exact sense in which the following terms will be used in this article:

Ore-shoots are those portions of an ore-deposit where the ore-bodies are so frequent, or so grouped, that partial boundaries of some definite shape and direction may be drawn around them, and such specially productive portions thus distinguished from the rest. The term is also applied to a single ore-body which has considerable extension in one direction.

An *ore-body* is, in general, a solid and fairly continuous mass of ore, which may include low-grade and waste as well as pay-ore, but is individualized by form or character from adjoining parts of the deposit.

Pay-ore includes those parts of the ore-body which are both rich enough and large enough to stope with profit.

In order that the facts may be clearly presented to the mind, the discovered ore is separated into two classes: *ore in sight* and *probable ore.*

"*Ore in sight*" is that contained in blocked portions of the deposit, each of which is so clearly exposed (by sections on several sides) that the limits, continuity, and value of its contents may be determined and relied upon with reasonable certainty. Such ore is thus a proven resource, ready for extraction, and is expressed in terms of net profit.

"*Probable ore*" is a more elastic term, and includes any blocked ore not certain enough to be "in sight," and all ore which is exposed for sampling, but whose limits and continuity have not been proved by blocking. It may also include any undiscovered ore which from the evidence is too strongly probable to be classed under the heading "chances indicated." Probable ore may be estimated in several distinct divisions, and the relative degree of probability assigned to each.

In practice, the ore-shoots and ore-bodies of a deposit, themselves irregular in form, are found penetrated by every conceivable arrangement of mine workings, from orderly shafts and levels to the "corkscrew rat-holes" of the prospector or lessee. Thus, every mine presents its own special problems.

The work of sampling and measuring both classes of ore is carried on at the same time and by the same methods. It is intended to estimate only the pay-ore; and since its practical limits are those which will afterward be defined by the actual stopes, it becomes necessary to ascertain what the shape and extent of these excavations will be, and measure only the ore within their limits.

In order to secure working room, the dimensions of the stopes will often be greater than those of the pay-ore, and will thus also include barren rock and non-profitable ore. No attention is paid to these worthless portions if they can be kept separate in breaking. If, however, ore streaks and waste are so intermingled that it will be necessary to break them down together and sort out the richer portions afterward, the measurements and samples are then made on the entire average mass as it stands.

SAMPLING ORE "IN PLACE."

The Four General Systems in Use.

1. A large number of small samples for assay, each of which is quickly and roughly taken, are cut from lines distributed at small intervals over the area of each plane section.

2. A limited number of large samples for assay, each carefully and laboriously taken, are cut from lines distributed at wider intervals.

3. Mill-runs. In this system each sample is either sent to a mill, where its actual yield is ascertained, or it is shipped to some sampling or smelting works, where an assayer's pulp is prepared from it by accurate sample reduction with machinery. The samples are very few in number on account of the time and expense required. In the first case, each one must be large so that it may be milled by itself and furnish enough product to clean up. In order that a sample may be representative, it is generally composed of ore from several points.

4. Panning in a miner's gold pan, or horn. This test is applied to a large number of very small samples, each of which has been roughly taken and pulverized for the purpose on a stone, or buck-board, or in a mortar.

Considerations in Selecting a System.

The *first system* is adopted to save time and expense whenever the second or third is unnecessary. There are many samples to assay, but the work of taking each one is small. It gives correct results only when applied to soft ore-bodies where the sample may be cut out easily and uniformly by pick, gad, or moil. The method is permissible only when the richest portions of the ore are not too much scattered in spots, streaks, or special layers, and are not too high in grade. In other cases it is applicable to very thin sheets of ore. It is frequently used on sections of probable ore, and for daily working samples in the operation of a mine, or in other cases where a quick, rough approximation is desired. Each sample may be small, requiring reduction to only one half or one fourth its bulk for the final package; again, it is often sufficient to break so little from each point that it may be sent entire to the assay office. There may be a large error in any single sample, but this is balanced in averaging by the great number taken.

The *second system* is necessary for all hard ore (requiring blasting), and for bodies in which the variations of value are great, or where the richest portions are irregularly distributed. It is always expensive and laborious, but generally the most accurate method, and is therefore most frequently employed. The sample broken is always large enough, from 25 pounds to 50 tons, to correctly represent the variations along the line of its cut, and is reduced to a small package for transportation to the assay office. Each sample is accurate, the error involved in the system being that due to the wide intervals between samples and the small number to be averaged.

The *third system* of "mill-runs" is rarely adopted unless a mill happens to be close at hand and the ore-body is of such size with values so variable or scattered that samples by the second system would be very large (10 to 50 tons), and the work of hand reduction therefore very great. If mill-runs are sent to a sampling or smelting works, the expense and delay are generally greater and the results are no more serviceable than those of careful hand reduction at the mine. Mill-runs are more useful for metallurgical tests than to determine the value of ore in place. For the latter purpose their results are frequently deceptive and they are therefore dangerous in unskilled hands. This is because each mill-run is so tedious and expensive that few are made, and thus but a few scattered points of the ore-deposit are tested. If each sample is composed of ore from various points, it is practically impossible to have the right proportion from each one, and the result is also subject to the serious errors of mixed samples. Again, the mill is often metallurgically unsuited to the ore, and it is more difficult to guard against fraud. When it is necessary to use this system, extra money and time should be provided for, and the samples made numerous enough for safety.

The *fourth system* of panning is restricted to free gold ore, and while it is not intended to furnish exact figures of value, it is very useful as an auxiliary method to determine the relative distribution of gold and the limits of pay-ore. In the regular operation of a mine it is often used to guide the work, and if checked frequently by assays or mill results, mine foremen sometimes become remarkably expert in judging the exact value from pan tests. This cannot be done with unfamiliar ores, but even then it is generally possible to distinguish roughly between ore above and below pay.

Distribution of Sample Lines.—Each sample is cut along a line, making a trench, or groove, of the same dimensions throughout, and so placed as to cross any principal lines of variation in the grade or character of the ore. The lines of sample cuts are impartially distributed over the area of the plane sections adopted, in positions as nearly equidistant as possible. The boundary between pay-ore and low-grade, or waste, is provisionally fixed by judgment. If in doubt about a low-grade streak, a separate sample is made of it. The width sampled is always the width measured.

Taking Samples.—In the first system the sample cuts are shallow, uniform grooves, say 3″ to 6″ deep and generally within 2′ or 3′ in length.

In the second system the quantity broken is fixed partly by the length of the line and partly by the distribution of values along it. The usual range is from 50 to 400 lbs. In order to secure reliable averages across a large and spotted ore-body the writer has found it necessary to break 25 and even 80 tons for single samples. These extreme quantities, however, were tested by mill-runs. The trench, or groove, is blasted out and afterward trimmed to uniform dimensions. Large samples, exceeding say 300 to 500 lbs., may be received upon the bare floor of a level, but when the bulk is less it is handled on canvas. This is protected from injury by covering with loose plank before blasting.

It greatly facilitates the subsequent reduction of the mass broken down to work upon a smooth surface. Thus, where many samples are to be taken along levels, it is best to lay temporary platforms, made of loose plank, beneath the sample points. A platform may be moved and relaid in ten minutes, and for a heavy piece of work three will do for a working force of one assistant and ten or twelve miners. In taking samples down a shaft or winze, a temporary platform is placed at each point. Work done in stopes also requires the use of movable platforms erected in any convenient way.

Samples from Loose Material.—In mine examinations it is frequently necessary to take samples from loose ore, dumps, mill tailings, etc. To obtain a sample of ore which is being extracted, one or more shovelfuls are taken out of each bucket, or car, and thrown into a pile to make the sample. In the case of sacked ore, a few pounds are taken from the top of each sack, or when greater accuracy is necessary every second or fourth sack is emptied on the pile. A pile of ore on the dump may be roughly sampled by taking one or more shovelfuls from each one of many points, distributed at equidistant intervals over its surface. The only safe method, however, is to drive several open trenches or tunnels through the mass, taking, say every tenth shovelful for the sample. For a dump of mill tailings, a boring tool is used, made of a 16″ piece of 2″ pipe. This is easily carried to the mine and attached to a handle of convenient length. The dump is pierced by bore-holes at equidistant intervals, and the borings from each hole are reduced and assayed separately.

Reduction of Samples.—The reduction of a sample from its original bulk to that of the assayer's package, does not differ in principle from the process followed at sampling and smelting works, but requires less accuracy. Moreover, instead of using machinery and routine methods, the reduction must be made on the spot by hand, upon samples varying greatly in grade and quantity, and under every disadvantage of underground conditions, from showers of water to the cramped quarters at the bottom of some narrow hole. Therefore, no two samples are reduced in the same manner, and fixed rules are impossible, so that it becomes necessary to recount with some detail the fundamental principles of the process as applied to underground work. It is not, however, within the purpose of this paper to enter into the many practical details of manipulation, although accuracy in hand reduction depends largely upon skill in these small points.

The process of reduction requires the continual repetition of two consecutive operations. First, crushing to a certain maximum size; second, the impartial selection of a fractional portion of the mass. The latter operation comprises the two consecutive acts of mixing and cutting, these being performed once or several times until the definite fraction desired is obtained.

Whatever final limit of error is permitted for a given sample, it is a rule that at each repetition of this series of operations they must be performed with more care than before. In consequence of this a very large sample requiring many repetitions of the series finally reaches a stage where so much care and accuracy are necessary that handwork is too laborious. At this point the sample, whatever its bulk, should be made up into the final package and sent to the assay office, where crushers, grinders, the buck-board, and fine sieves are available for the final operations. Thus the bulk of the final package is fixed by deciding whether it is better to incur the expense and delay of pushing reduction a step or two further at the mine, or, on the other hand, to bear the cost of transporting a greater weight to the assay office. In practice, the packages generally range between 4 and 10 lbs., and frequently reach 25 and 50 lbs., especially when the assay office is near.

Crushing.—The ore is broken so that no lump shall exceed the maximum size decided upon. Very rich lumps are broken smaller in order to distribute their value. During the final stages of reduction a pair of sieves with $\frac{3}{4}''$ and $\frac{1}{2}''$ meshes are useful to separate out those lumps which require breaking.

Relation of Maximum Size to Bulk.—The instinctive judgment derived from long experience in sample reduction is necessary to promptly decide the maximum size and the fraction to be selected at each series of operations. These must be so taken as to keep the work within the limit of error allowable, and at the same time have it move rapidly. Since this relationship of maximum size to bulk depends on several variable conditions, and is never the same for any two samples, it is impossible to illustrate it in a very satisfactory way. The first column of the following table will, however, give an idea of the maximum sizes selected by general judgment for two typical cases of reduction.

TABLE ILLUSTRATING THE RELATION OF MAXIMUM SIZE TO BULK IN TWO TYPICAL CASES OF HAND REDUCTION.

An average ore is taken, containing $10 to $50 per ton, and it is assumed that the richest lumps of full size do not assay more than five times the above value.

	Sizes Adopted in Practice.	Theoretical Sizes as Calculated by Reed's Formula. Maximum Size of Lumps. (Diameter in Inches.) Allowing a Limit of Error of—	
		5%	10%
CASE I.			
Reduction of an 1,800-lb. sample to 7 lbs. by taking one fourth after each crushing.			
1,800 lbs. prepared for reduction by crushing to	4 in.	3 in.	3.8 in.
The 450 lbs. prepared by crushing to	2	1.9	2.4
The 112 lbs. prepared by crushing to	1	1.2	1.5
The 28 lbs. prepared by crushing to	0.5	0.75	0.9
And then reduced to 7 lbs.			
CASE II.			
Reduction of a 300-lb. sample to 5 lbs. by taking one fourth after each crushing.			
300 lbs. prepared for reduction by crushing to	2.5	1.7	2.1
The 75 lbs. prepared by crushing to	1.0	1.0	1.3
The 19 lbs. prepared by crushing to	0.5	0.6	0.8
And then reduced to 5 lbs.			

Reed's formula* is the result of an effort to find a rule which will express mathematically the effect of the aforesaid conditions for any case. It does this in a very satisfactory manner for the accurate work of sampling and smelting works where the limit of error is 1%, and it is of interest here to compare the above figures, taken from practice, with its theoretical results. The other two columns, therefore, show the sizes calculated from the formula for limits of error of 5% and 10%.

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*Columbia School of Mines Quarterly, 1885, Vol. VI, p. 351.

The differences between these and the practical sizes are mainly due to the fact that for hand reduction several of the constants used in Reed's formula change with each repetition of the series of operations. There are also more repetitions than with machine reduction.

MIXING.

The three following methods of mixing are used in mine work:

1. *Pouring* from one pan into another. This imperfect method is used only in the final stages of reduction, and when it is to be followed by riffle-cutting.

2. *Rolling* in canvas. This is the best method known, and is used whenever the sample is small enough to handle, say under 200 lbs.

3. *Coning.*—The sample is shoveled into a conical pile so as to secure a uniform radial distribution.

The care used in mixing depends on the method of cutting which is to follow. Quartering requires very accurate mixing. It is not necessary for shovel or riffle cutting, but even here the work is improved with little trouble by roughly mixing before each cut.

CUTTING.

Three methods of cutting are used in the reduction of mine samples:

1. *Shovel-Cutting.*—The pile is shoveled over, one shovelful out of a certain number being taken to make the sample. The ratio depends on the bulk and the accuracy required, but may be, say, one in ten for a bulk of over 5 tons, one in three for 1,000 to 2,000 lbs., and one in two for smaller quantities. The latter is the ratio used in most cases, even for larger amounts.

2. *Quartering.*—The pile of ore, thoroughly mixed, symmetrical in shape and with the coarse and fine symmetrically distributed, is flattened and divided into quarters, two of which are taken.

3. *Riffle-Cutting*, or "splitting" on a hand-riffle. The size preferred for most underground work has several parallel troughs 1¼" wide, and the same distance apart, so that it may be used whenever the sample has been crushed small enough to pass this space. Riffle-cutting is the most accurate and generally the most rapid method in use.

Choice of Cutting Methods.—Shovel-cutting is specially adapted to a large bulk, but when this becomes small, say 150 lbs., it requires too much labor and skill to insure accuracy, and either of the other methods is used. In the absence of a riffle, the work is finished by quartering, but otherwise the riffle is taken as soon as the lumps are small enough. Quartering is therefore used in the intermediate stage when the bulk is too small for rapid shovel work, but not yet ready for the riffle.

Assay Office Work.—The assayer is always instructed as to the crushing size and further reduction of the sample package to the final assay pulp. From his results the assay value of each sample is so calculated as to conform to the plan of cost estimate adopted.

Samples for Special Purposes.

Sorting Tests.—In mines where the ore broken and hoisted must have its richer portions sorted out to make a marketable product, it is necessary to determine the percentages of total value and of tonnage, which are thus available. Sorting tests are made upon the mine samples, using those coarsely broken portions which were rejected during the first operations of reduction. These are mixed proportionately to form a few group samples, and experienced ore-sorters from the neighborhood are put to work upon them. All the resulting products from sorting each sample are then weighed or measured to determine their relative weights, and each product reduced to the assay office package. When underground sorting is done, the results of this are also determined.

Mixtures for Analysis.—Since the market value of smelting ore depends largely upon its chemical composition, proportional mixtures for analysis are prepared from the final pulp samples of all such ore.

Metallurgical Tests.—When metallurgical tests are required, such as those for concentration, free-milling, pan amalgamation, wet processes, etc., proportional mixtures are made for the purpose, often out of the rejected portions of the mine samples. In securing mixtures for tests on a large scale the difficulties incident to mill-runs are kept in view.

Rejection of Excessive Assays.

Ore-bodies frequently contain occasional streaks or pockets of high-grade silver minerals or metallic gold, and a sample here and there may chance to include one of these, thus giving an assay far above the general average. Since all the samples taken are at best few in proportion to the mass represented, the error introduced by averaging in such assays may be very great. It is therefore necessary after plotting the assay results to reject such values, and some arbitrary figure, corresponding to a mean of the next adjoining samples, is substituted for use in averaging.

Danger of Mixed Samples.

It is here necessary to call attention to the danger incurred in the practice of uniting a number of samples and assaying the mixture. It is practically impossible to mix in correct proportions, and this plan also fails to furnish the necessary information about the distribution of values and the limits of pay-ore. The results are also liable to serious error from excessive samples, as explained above.

THE MEASUREMENT AND ASSAY VALUE OF SECTIONAL AREAS.

The Determination of Areas in Sight.

All the plane sections which have been selected to serve as the basis of measurement are plotted to scale. The drawing of each section includes all workings, measurements, and ore limits shown, together with the sample lines and the figures of their length and assay value. Upon the section is then sketched that portion of the ore-body which, according to judgment, is safely proven by the mine workings within the plane of section, and may therefore be considered "in sight." In this operation a variety of problems is presented, those commonly occurring being illustrated by the typical cases shown in Figs. I to VII.

In each figure the outer heavy black line shows the actual ore-body. The heavy dotted line is the limit decided upon for the portion in sight. Within the thin black lines are the portions supposed to be pay at the time of measurement, and therefore sampled. The shaded areas show the actual pay-ore as finally fixed by the sample results.

Fig. I is the section of an ordinary vein presented in a level where the entire thickness of the ore-body is visible.

In Fig. III, the actual bounding surface of the body appears at *A B C* and thus indicates the most probable direction to be given to the curved line limit for ore in sight.

In Fig. II, where no boundaries are disclosed and the ore has no definite structure to guide the judgment, the curved line *A B C* is taken.

In Fig. IV the ore-body is an irregular mass whose contents are arranged in streaks or layers definite enough to justify the limit *a b c d*.

Fig. V shows a thick sheet composed of regular layers, in which the limit *a b c d* may be taken if the entire mass is pay-ore, but if it is limited to a few streaks like the two shown, their continuance is less certain and *a b f d* is taken.

In Fig. VI a thick sheet of ore in layers is shown by the single cross-cut *K* in the long level *e f*. In drawing the limit *a b c d e f g h*, it is a matter of experienced judgment how much of the sheet is really proven by this cross-cut, and how great a length may be given to *a b*.

Fig. VII is a similar sheet in which the layer-like structure of the ore-body warrants the limit *a b c d*. When including areas not actually visible, care must be taken that no one is of such excessive value that its possible variations will introduce a serious error into the final total estimate.

Fixing the Boundaries of Pay Areas.

The actual pay areas, as included within the intended stopes, are determined from the assay values of the samples. Whether these are above or below pay is generally evident from inspection of the values as they appear upon the section drawing, but in many cases it is necessary to make an approximate estimate of cost for each point. As this calculation is sometimes laborious, the most convenient methods are illustrated by the following three special cases.

In all the sections the figures show the sample numbers, and lines indicate the sample cuts. The length of each sample cut in feet or inches, and its assay value in dollars per ton, are also given for each sample.

Taking the ordinary vein shown in Fig. I, it has been found that the ore in place measures 13 cu. ft. per ton and the cost of stoping is $16 per fathom of 36 sq. ft. The sorting tests have shown that one ton of average ore broken yields 0.50 ton of shipping ore, and that this contains 75% of the total value which was in the original ton broken down.* It has also been estimated that the approximate cost of hoisting, sorting, shipping, and smelting will be $12 per ton, figured upon the tonnage of ore broken. The following table is then calculated :

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*While the results of sorting vary according to the grade of the ore, and are not the same for any two points in the pay streak, it is nevertheless accurate enough for this purpose to use the average figures.

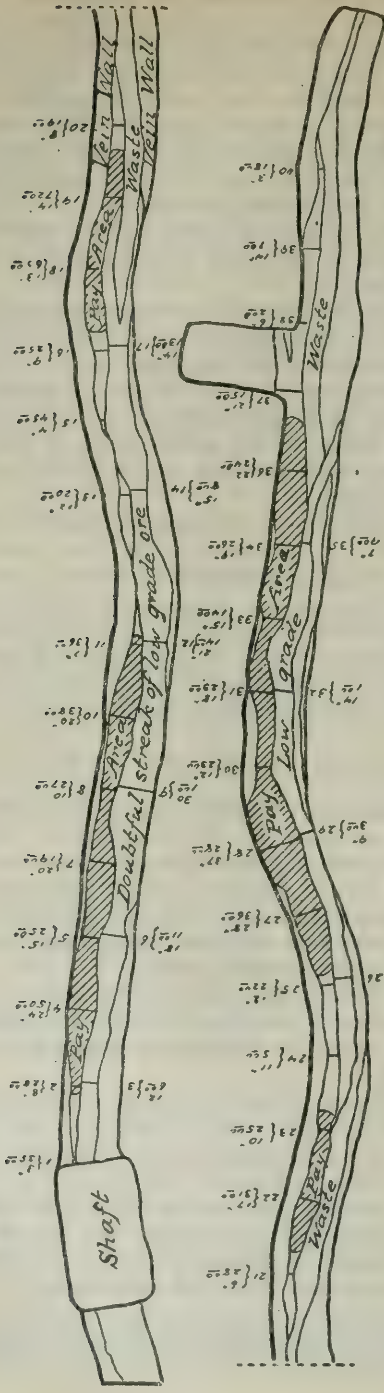

Fig. 1. Section of thin vein exposed in a level.

APPROXIMATE YIELD AND COST OF STOPING PER TON OF ORE BROKEN.

Thickness of the Pay Streak at the Point Considered.	Tons per Square Fathom of Ore Sheet.	Cost of Stoping per Ton.
A streak 4″ thick yields	0.92	$17 33
" " 6″ " "	1.38	11 55
" " 8″ " "	1.85	8 67
" " 10″ " "	2.31	6 93
" " 12″ " "	2.77	5 78
" " 14″ " "	3.23	4 95

Applying these figures to any doubtful sample point such as No. 20, the following estimate is made:

Cost of stoping an 8″ streak per ton	$8 67
Cost of hoisting, sorting, shipping, and smelting, per ton of ore broken	12 00
Total expense	$20 67
Value saved is 75% of the assay value of $19	14 25

Thus demonstrating that the ore at this point will not pay to extract.

All pay points have been determined and marked; the pay areas which are to be included within the stopes are sketched. (See shaded portions of the figure.) These areas are then measured by scale, or calculated, and the length and average width of each one is also determined.*

In Fig. V the plane of an irregular drift and cross-cut presents a fair cross-section of a wide vein whose structure is in parallel layers. Four of the ore streaks shown have been sampled, but only two of these have proven to be above the pay limit. They are so far apart as to require stoping separately, and are therefore treated as though each one was a distinct vein. The pay areas are fixed as in the previous case, and extended to the limit adopted for ore in sight.

Fig. II illustrates the application of this method to the section of an irregular body of milling ore. It is in this case a more simple matter to compare the assay value of each sample with the total cost of mining and milling, plus the tailings loss, this sum being here taken as $5 per ton.

The pay areas outlined are carried only to the limit previously fixed for ore in sight.

METHODS OF AVERAGING THE SAMPLES.

In each section the value of its pay areas, either singly or jointly, is determined by averaging all the samples within these areas. In doing this each sample is given a weight proportional to that part of the area which it represents.

When uniformly spaced, as in some parts of Fig. I, each sample value

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*Of the well-known methods for measuring such areas, the following will generally be found most convenient and rapid for this purpose: A small piece of thin transparent paper is ruled with parallel lines, 2′, 5′, or 10′ apart by scale, as the case may require, and this is placed over the area to be measured. The lengths of the strips thus formed are then measured by a scale.

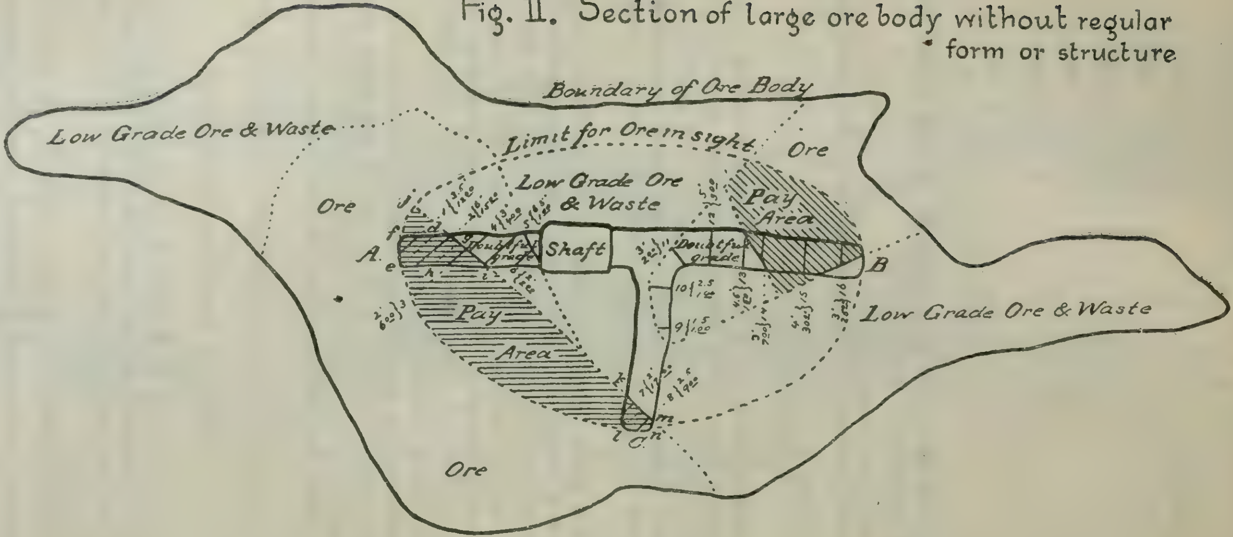


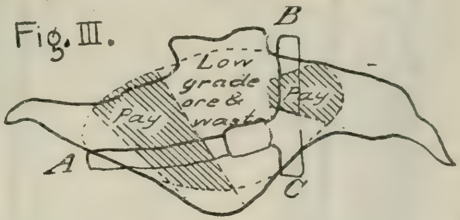
Fig. II. Section of large ore body without regular form or structure

is multiplied by the length of its line and the sum of the products is divided by the sum of these lengths.

When irregularly distributed, it is necessary to sketch by judgment that portion of the pay area which may be allotted to each sample. In doing this due regard is paid to the structure of the ore, whether homogeneous, in layers, or otherwise. In every such portion the number of square feet is then measured and multiplied by the value of its sample. The sum of these products divided by the total area gives its average value.

In Fig. II the pay area *e f j m n l* has been exposed for sampling only at two places, *A* and *C*. The average value of each part thus exposed, such as *e f d i*, is first determined by letting each sample represent the ore half way to that next adjoining. Sample No. 1, therefore, represents the portion *e f d;* No. 2 represents *e d g h;* and No. 3 represents *h g i*. The average value of part *m n l k* is determined in the same way. The number of square feet in each of these two exposed parts is then multiplied by its average value thus determined, and the sum of both products divided by the sum of both areas. The result is taken as the average value of the unseen part *e i k l*. The part *d j f* is assumed to have the same average value as *e f d i*.

Fig. III.



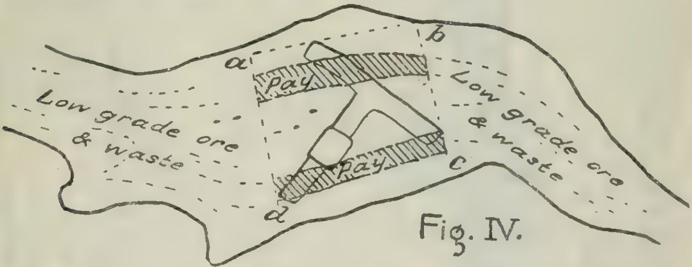


Fig. IV.

In Fig. V a variation is made from the plan just described because of the layer-like structure and the distance between the exposed places. In the upper pay streak the average value determined as before at each of the two exposed places, *h m l g* and *n q u r*, is assumed to extend half way through the unseen portion to the line *e z*.

Fig. VIII illustrates the use of this method for averaging samples in the section of probable ore exhibited by a vein outcrop. The samples were taken wherever the ore was uncovered, from scattered outcrops and shallow prospect pits. The structure of the vein was very regular, being in uniform layers, so that each sample was assumed to represent the layers cut by it for a distance half way to the next adjoining samples. For instance, the sample line *a d* represents the area *a k l b* + *b i j d* + *c g h d* + *a c f e*.

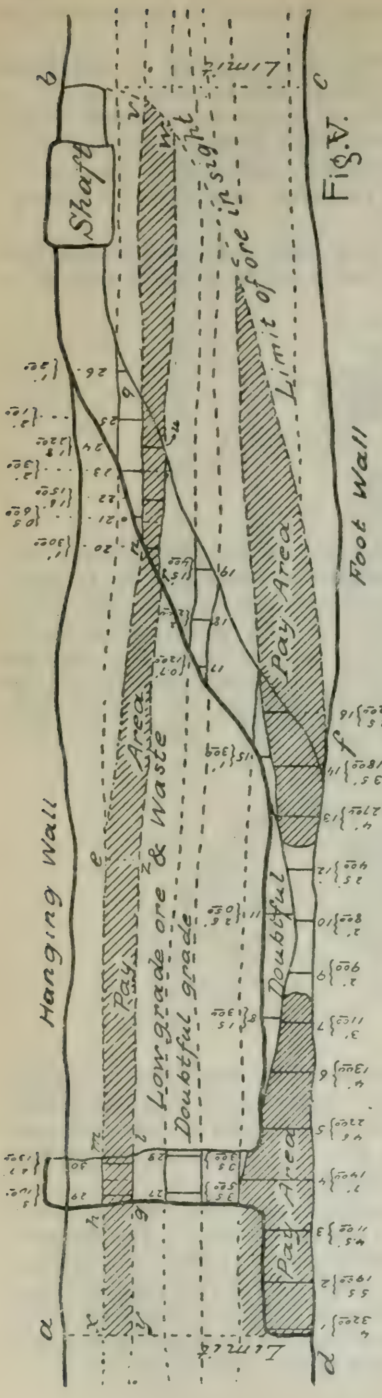


Fig. V.

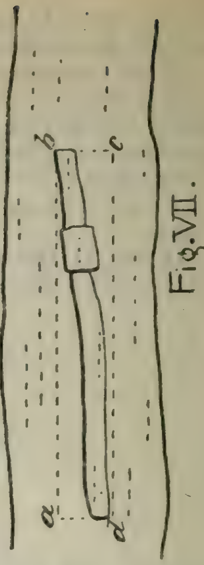


Fig. VII.

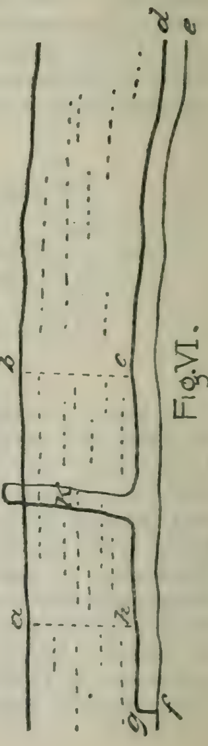


Fig. VI.

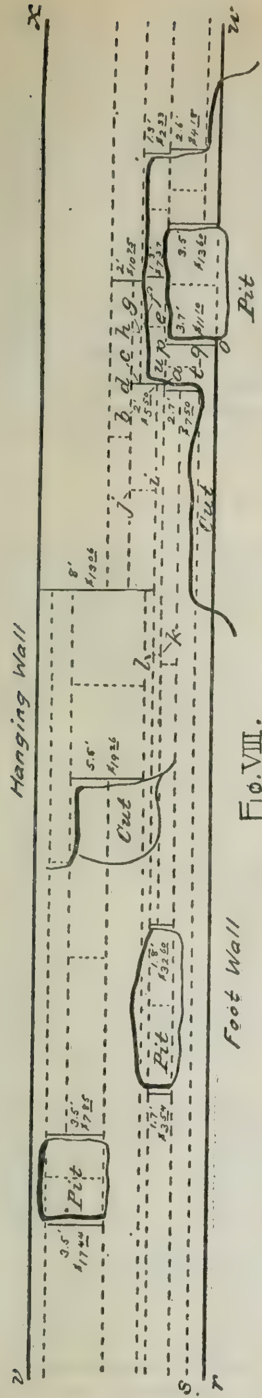


Fig. VIII.

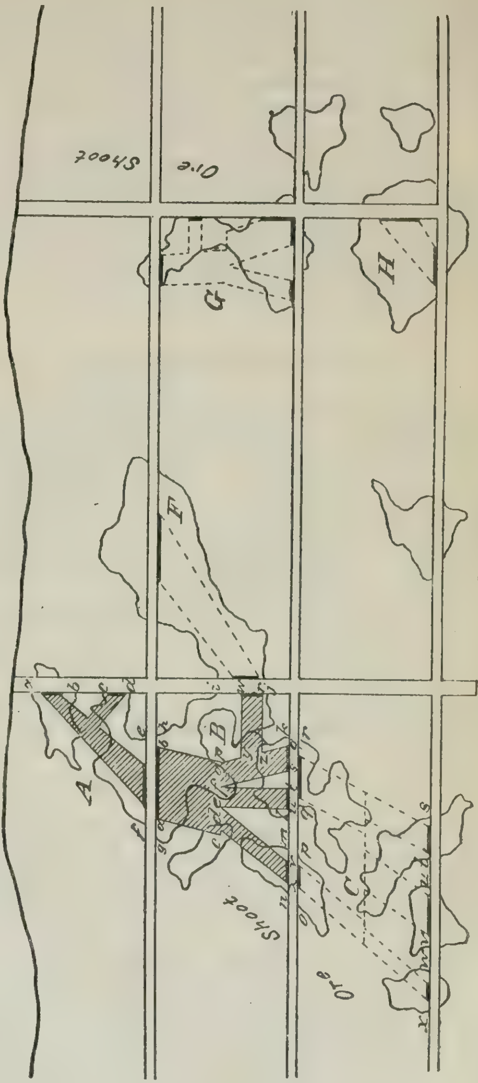


Fig. IX.

It will be noticed that these fractional areas are not all represented with the same degree of probability, and sample *o p*, for instance, is more certain to correctly represent the area *p q t u* than area *o r s q*. This is because the samples could not be uniformly distributed. If it happens for this reason that any areas are not well enough represented for the object in view, they should be excluded. In this case it was sufficient for the purpose to include all parts of the area within *w x v r*.

The same method is used for all special problems of this kind, such as where samples are taken irregularly over a large open quarry of ore, or where a mass is pierced by scattered bore-holes, or exposed by test pits. A case of the latter is shown in Fig. XIII, where the thickness and value of the ore-sheet cut by each pit is given by figures. The outer line is the adopted limit within which the ore-body is considered probable, and the dotted lines show the area allotted to each sample point. Each area is multiplied by the ore thickness to give the volume, and this is multiplied by its sample value. The sum of the products is then divided by the sum of the volumes.

THE MEASUREMENT AND ASSAY VALUE OF VOLUMES.

The object of measurement is always to determine the *most probable* volume and value indicated by the sections for the unseen interior of a block. How closely these figures agree with the facts depends on the regularity of structure in the ore-deposit, and also on the proportion between the volume of ore in the block and the area of ore exposed in its sections. Blocks are frequently thrown into "ore probable," because the distance between the two opposite faces is too great for the small amount of ore exposed in them.

The judgment acquired by long experience in the structure of ore-deposits is necessary to decide these questions so that the results will have the certainty required for "ore in sight." It is also necessary to judge how much these most probable figures may vary from the truth, and apply the safeguards and the factor of safety hereafter mentioned.

Ore-Sheets of Ordinary Thickness.

The cases most frequently presented in practice are illustrated by Fig. IX, which is a section on the plane of an ordinary vein whose thickness does not exceed the width of the mine workings. The pay areas determined in the various sections are indicated by heavy black lines.

Blocks with Two Parallel Sections.—This case is illustrated by Block *C*. It is treated as a prismoid whose end areas are constituted by the sums of the pay areas in each section. Unless one end area is very much smaller than the other the use of the prismoidal formula is an unnecessary refinement. It is generally sufficient to average end areas and multiply by the perpendicular distance.

The average assay value per ton is obtained by multiplying the average value in each section by its total pay area and dividing the sum of these products by the sum of the areas.

Blocks with Three Sections.—Block *B* is of this class, having the sections *n k*, *i j*, *g h*. Two of these sections are often found to be more representative than the third. Its results are therefore sometimes omitted in whole or in part, and sometimes merely given less weight. When all the sections are used the block is measured by the *method of equivalent figures.*

Taking Block *B* as an illustration, the sections *g h* and *i j* each have one pay area, while section *n k*, which cuts two ore-bodies, chances to expose three pay areas. The number of square feet, average value, actual length, and average width, have been determined for each of the five areas. The purpose is to sketch within the block an average figure assumed of a certain uniform thickness, and of such shape that it will be the most probable equivalent of the pay-ore included in the actual stopes.

The uniform thickness adopted for this purpose is the average thickness of the pay-ore, which is found by adding the five pay areas and dividing by the sum of the five lengths. Each pay area is now divided by this uniform thickness, giving the length of an equivalent area, and these *assumed lengths* are plotted to scale in their average positions. (See lines *a b*, *w r*, *q s*, *t u*, *v x*.)

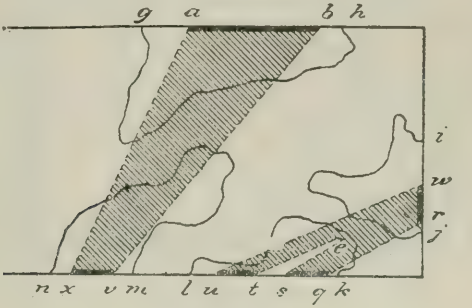


Fig. X.

The equivalent figure shown by the shaded portions of the block is now sketched from these lines. In doing this due regard is given to the indicated structure, the object being to place the figure in the position probably occupied by the assemblage of pay portions. Assuming that in this block the main shoot evidently passes from *a b* to *x q*, the figure is drawn symmetrically between them, allowing each area to represent conditions half way through the block. The area *w r* thus appears to be a side projection, and the figure *w r z y* is drawn from it to meet the main figure at the nearest point. The area of the entire figure is then measured by scale and multiplied by the uniform thickness. Block *G* illustrates a similar case.

Fig. X shows Block *B* when the structure indicates that one or more bodies extend between sections *i j* and *k l*. This gives two equivalent figures, *a b v x* and *w r q s e t u*, or it may be treated as a combination of the simple cases under I and III.

In the method of equivalent figures, the average value is determined by multiplying the value of each pay area by that portion of the total volume which it represents. The sum of the products is then divided by the total volume.

Blocks with Two Perpendicular Sections.—In the simple case illustrated by Fig. XII the pay area in each section is converted to an equivalent

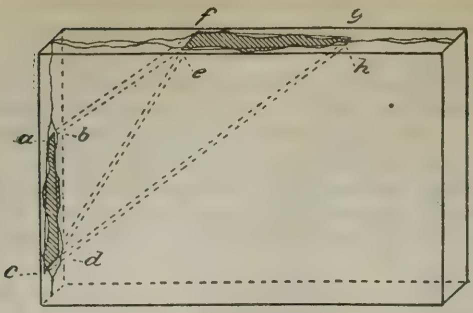


Fig. XI.

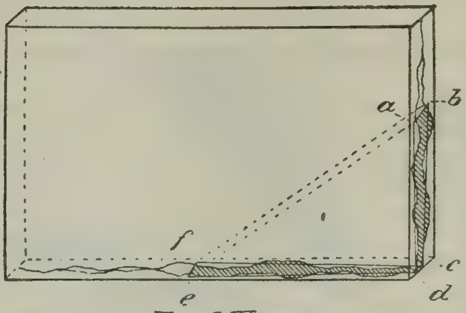


Fig. XII.

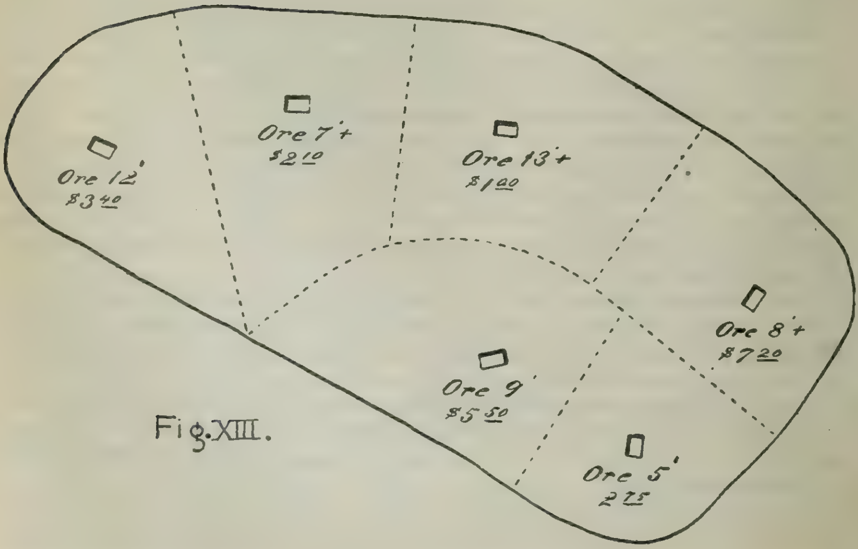


Fig. XIII.

trapezoid like *a b c d*, whose shape conforms as closely as possible to the average actual shape of the pay streak by having the same length and by being wider at one end than the other, if necessary. The ends *a b* and *c d* are parallel. The two trapezoids are sides of an irregular wedge to which the prismoidal formula is applied.

Fig. XI shows in perspective the case of Block *F*, Fig. IX. Here the areas are also converted to equivalent trapezoids, and the figure cut into wedges by the intersecting plane *c d f e*. Blocks *A* and *H*, Fig. IX, also illustrate this case, the method of equivalent figures being used for Block *A*.

In wedge measurements the average value is calculated by multiplying the total pay area of each section by its value and dividing the sum of the products by the sum of the areas.

ORE-DEPOSITS OF OTHER FORMS.

In irregular bodies blocks are usually found with two parallel sections, but at times peculiar and more difficult problems are presented. The section planes are occasionally at an acute angle to each other, and while the method of case III will generally apply, no rule can be given when each section shows several irregular pay areas. For such problems special expedients may always be devised. Masses cut by test pits or bore-holes have their volume measured as explained by Fig. XIII.

In practice, blocks are often found with their contents partly stoped out, offering problems more complicated than the typical cases described. Additional planes of section are usually afforded by such stopes, and it is generally necessary to divide the block contents into several parts, each of which is measured separately. In such cases there is no difficulty in applying the principles already illustrated.

RAPID APPROXIMATE METHODS, DUMPS, ETC.

Rapid approximate methods are frequently used for preliminary estimates, or to check the results of detailed measurement and sampling, or to determine probable ore, or in estimating the chances for further discoveries, etc.

Sometimes the contents of an ore shoot or body are estimated from the average yield per unit of area or length of other portions already worked.

Again, a continuous sheet of ore is sometimes so intersected by mine workings as to expose and prove the sheet within the area bounded by a line circumscribed about these workings. It may then be unnecessary for the purpose in view to estimate each block separately. The entire area which is considered proven is measured as a whole, and the number of square feet of vein area excavated by the workings is also measured and deducted. From the total yield of the area already worked, that of the remaining portion may be calculated.

When this quick method is applied with judgment to the proper conditions, and the actual figures of production are known with *certainty*, its results agree very closely with those of detailed measurement and sampling, and are often used to check them.

Dumps are measured by ordinary cross-sections, but since they are generally on an inclined hillside, it is not always convenient to measure from the horizontal base plane of an instrument. A string or line of sight between two poles is often preferred, and is accurate enough for the purpose. Irregular sections are always plotted.

THE REDUCTION OF VOLUME TO TONNAGE.

This is done by using the factor of cubic feet per ton for the ore in question. This factor is derived in two ways:

I. By Calculation from the Specific Gravities of the Minerals.

This method is applicable only to ore composed of simple minerals or simple rocks or their combinations in known proportions. A safe margin is always added to the theoretical result, because the standard specific gravities given are the figures for pure, dense crystallized specimens, while in ore-deposits the minerals are often more or less altered and somewhat amorphous and porous.

The following table gives the calculated figures for these minerals and rocks of which ores of the precious metals are mainly composed. The first column is the theoretical result, calculated from the average specific gravity, and the second gives a general figure for practical use.

Figures thus assumed from calculation are always applied with much caution and judgment, because when rocks are so impregnated as to become ores they are generally full of small fractures, and may be spongy or porous. The figures for practical use are calculated from the minimum specific gravities given by the authorities, with an addition of about 5% for variations, crevices, cavities, etc.

Number of Cubic Feet per Ton.

Material.	Number of Cubic Feet of Solid Material in Place, Per Ton of 2,000 pounds.	
	Theoretical Figure Calculated from the Average Specific Gravity. (For Pure Unaltered Specimens.)	A Figure for Practical Use.
Galena	4.3 cu. ft.	4.7 cu. ft.
Pyrite	6.4 " "	7.0 " "
Blende	8.0 " "	8.5 " "
Hematite	6.6 " "	7.5 " "
Limonite	8.4 " "	9.4 " "
Dolomite	11.4 " "	12.5 " "
Limestone, Andesite, Syenite	11.9 " "	13.0 " "
Vein Quartz, Granite, and Granitic Rocks	11.9 " "	13.5 " "
Clay, Quartz, Porphyry, Trachytes, Rhyolites, etc.	12.3 " "	14.5 " "
Vein Quartz with 15% Galena	10.7 " "	12.2 " "
Vein Quartz with 15% Pyrites	11.1 " "	12.5 " "
Vein Quartz with 10% Hematite	11.4 " "	12.9 " "

II. By Practical Tests.

Oxidized ores are generally amorphous, loose, and porous, and cannot be calculated. Their volume is therefore determined by practical test by any of the following methods:

In a thin sheet the ore may be stripped and several tons broken down and weighed, after carefully measuring the thickness and area broken to determine its volume.

In a mass of ore the writer has used the figure obtained by carefully stoping the right rectangular prism to be filled by one "square set" of timbers.

The determination is made on a small scale by filling a bucket, tub, or box of measured volume with weighed, coarsely broken ore, and then pouring in water, level with the top of the ore. The total volume occupied is then measured, the water is poured off and its volume measured; the difference being the volume of the solid ore. Occasional determinations of this kind on various ores soon make it possible to select a safe factor in most cases by judgment, since the principal object is not scientific accuracy, but safety.

Loose ore piled on dumps in pieces from head to gravel size will have from 35% to 50% of interstitial spaces, the percentage being greatest if the lumps are somewhat equal sized. Thus a dump with 40% of spaces, and composed of ore averaging 12.7 cu. ft. per ton in place, will measure 21.2 cu. ft. per ton.

ESTIMATE OF THE TOTAL NET VALUE.

The net profit, or *net value*, of the ore measured and sampled is generally figured by the ton, either by a separate calculation for each individual block, ore body, or shoot, or by one calculation for the entire mine. Conditions are generally uniform enough for the latter plan. The tonnage of ore measured is only what will be actually broken down. The sample assays represent this measured ore as it will be when broken, and before it is sorted, either under or above ground.

The methods of calculating the net value of this ore from these data vary with every case, but their details are not of interest here. It is, however, necessary to call attention to the four principal factors which usually enter the problem, and the variations in calculating each factor.

The Four Principal Factors Commonly Used in Making Estimates of Total Net Value.

I. *Gross or Assay Value* per ton. This is always figured on the "ore broken," and from the assays and analyses. It is either:	1. *Full Value*, according to N. Y. quotations for the valuable metals contained. 2. *Partial Value*, with various losses, expenses, and deductions subtracted here.
NOTE.—The assay value of various products from the ore broken is often required, such as: (This is determined by calculation or by special tests.)	1. *Ore Milled* (after some sorting). 2. *Sorted ore shipped.* 3. *Concentrates.*
II. *Losses* (to be deducted from the assay value) are either expressed per ton, or as a percentage of the "assay value." They comprise either:	1. *All the losses.* 2. *Part of the losses*, the remainder being placed in I or IV.

III. *Tonnage* used is either:	1. *Ore measured* = ore broken. 2. *Ore hoisted* = the ore broken; often after it has been reduced somewhat by underground sorting. 3. *Ore shipped* = the ore hoisted, generally after it has been further reduced by sorting on the surface. 4. *Ore milled* = either the ore hoisted, or this reduced by further sorting.
IV. *Cost* per ton may be figured on either of the above tonnages or on that of the products, such as concentrates, etc. It includes both:	1. *Cost of Mining:* Including general expenses and "development" only so far as they are required for extraction of the blocked ore "in sight." 2. *Transportation and Treatment.* Some of the losses and smelter deductions from assay value are often included here.

It is to be noted that each one of these four terms is meaningless unless accompanied by a full explanation of how it is figured.

In estimating losses on milling ores it is not often safe to deduct a given percentage, but the loss should be expressed by a definite number of dollars per ton. The reason for this is that the loss in such ores is generally quite constant, and bears little or no relation to their original contents.

SAFEGUARDS AND FACTORS OF SAFETY.

Throughout the work the following principles are kept in view:

The accuracy with which a sample is made to represent its line should be somewhat proportioned to that with which this line represents its area, and the area its volume. At the same time, since the limit of error in the sample is controllable, it is kept much less than the possible errors of area and volume, which are fixed by the conditions of the mine.

The possible error in the estimate of a block must be provided for in one of two ways. If there are a number of blocks not differing greatly in value their errors will balance according to the probability of averages. If there are but few blocks, or the value of some one is so great that its possible error will be a large percentage of the final total estimate, a safety deduction is made to cover this possible error. The necessity for this deduction and its amount are matters for experienced judgment. Probably every one engaged in this work has had occasion to notice the danger in an estimate of ore in sight, based upon a single block, the variations of which are not balanced, and in this case a liberal deduction is often necessary for safety.

Fraud in some form, generally from salting samples, is a danger often possible, and every engineer devises his own private system of safeguards, but no system can do away with the necessity for constant care and vigilance.

COMSTOCK ORE-SAMPLING.

By John S. McGillivray.

Written for the "Mining and Scientific Press," February 29, 1896.

The rehearing, before Judge Hebbard, of part of the Hale & Norcross case, furnishes, in the evidence offered, some valuable lessons to miners, not only on the Comstock, but everywhere. Judge Hebbard had found, in the first trial of the case, that the Hale & Norcross sustained damage by the imperfect milling of the ores in the amount of $789,618. He held that the amount returned by the mills in bullion was 52.11%, and that it should have been at least 75% of the car sample assays.

The Supreme Court was not satisfied with the evidence upon which he had based his conclusions, and sent this part back for rehearing. In the rehearing the subject of ore-sampling, and of the methods of milling on the Comstock—as to the evils and the causes of them—was gone over by the best of practical miners and experts, and many points of interest were brought out.

Louis Janin, the well-known mining engineer, was called as an expert witness in the case. Mr. Janin has had many years' experience in mining and milling on the Comstock, and is thoroughly familiar with all the methods of mining in vogue there. So, on the stand, he went over practically the whole ground in dispute. Aside from its bearing on the case, much that he said is worth the attention of miners. What follows in this article is made up from his evidence, as given on the trial, from data furnished by him to the writer, and from authorities he used for reference while on the stand.

As to the sampling itself, upon which the case mainly hinges, it was shown that a very careless system has been in vogue on the Comstock ever since the beginning of mining there. Correct assaying of ores is the main check by which millions are guarded wherever mining is done, and if assaying is to be of any value at all, careful and correct sampling must be done. Professor Christy, of the College of Mines of the State University, in a paper published by the American Institute of Mining Engineers, says of this:

"Haphazard and occasional sampling and assaying are worse than useless. They lead to great losses of valuable capital, frequently to the total abandonment of good properties, and, worse than all, to a false sense of self-satisfaction, that discourages improvement by denying its necessity."

By sampling is understood the final delivery to the assayer of a comparatively small proportion of ore, which accurately represents a very much larger volume of the same material. That is to say, in proportion to its quantity, it will contain precisely as much, or as little, of the gold and silver as a ton will of the rock sampled. The greater the proportion that is taken of the ore-body, the more likely it is that it will represent an average value. Ordinarily, metallurgical works which treat ore from many sources, or buy ore from many different people, pay for the ore on the assay value. The proportion that is taken for a sample of the total amount is one tenth or one twentieth of the lot; or, if the lot itself is small, say ten tons or under, the whole amount. This proportion that they thus select, is crushed fine and thoroughly intermixed.

On the Comstock, a grab sample is taken from the carload of ore, which is not thoroughly mixed, and the pieces of which are very far from being uniform in size, and instead of one tenth or one twentieth of the lot, the amount grabbed is probably not over half a pound from the carload, which weighs nearly a ton. In one case one part in 10, at least, is taken, and in the other, one part in 4,000. Moreover, in the former case, the whole lot is crushed, to permit of uniform mixture; but on the Comstock only about 8 lbs. of the day's samples, of say 100 lbs., are taken from the sample-box, and that, too, without crushing or quartering down, for the assayer; in other words, the assayer takes his assay from one part in 48,000.

The manner in which the carman takes the sample from the carload of ore, weighing about a ton, is necessarily incorrect, for the carload itself is not an intimate mixture, which is required in good sampling, and the quantity that he takes, as stated, is but one part in 4,000. If, during the twenty-four hours, he has thus taken, say from 100 cars or 200, or whatever the number may be, the final result is the same small proportion of the total amount which he is supposed to be sampling. Nothing can be properly sampled which is not homogeneous, unless one gets a proper proportion of each component part.

In these ore cars the ore is generally in a finely divided state, but the waste rock is coarse. No man being asked to sample ore will take one or two pieces of the coarse as representing the mass, for he knows that it is not ore; he cannot help knowing it, and it is not in human nature for him to grab up masses of waste rock when he is told to sample ore; he only does it in cases where it is intimately intermixed, so that he does not know one from the other.

The manner in which the sample for the assayer is prepared is also incorrect, also supposing that there are considerably more than 8 lbs. in the box. A correct sample of the whole quantity which is in the box can only be obtained when the whole amount is reduced to powder, or, at least, in small pieces which will permit intimate inter-mixture. But 8 lbs. out of, say, 100 lbs. would be sufficient if the ore was in a proper mechanical condition, as stated. But in the manner in which this sample of 8 lbs. is taken from the box, the same errors may creep in as in taking the sample from the carloads, possibly even greater. It is true that a man, having 100 lbs. properly spread out, might sort out a closer proportion of poor and rich ore than the car-sampler did, but, as stated, it is a vicious sampling of a vicious sample, and no subsequent result obtained from an assay, no matter how made or how correct, can be depended on as showing the value of the ore-body which it is attempted to sample.

It may be said here that most of the milling on the Comstock is done by custom mills, and this makes it necessary for the mine-owners to take samples before the ore reaches the mill. The millman, for his guidance, takes samples from the pulp as it comes from the batteries.

In most cases throughout California and Nevada, where the mill and mine are under one ownership, assays are made only from the battery pulp. That the mill sample on the Comstock is far better than the haphazard car sample may be easily seen. The ore is broken down in the mine, thrown down an ore-chute, put in the cars, goes to the ore-bin at the mine, then to the ore-cars of the railroad, and finally is dumped into the ore-bins at the mill, where it is broken up by the rock-breakers before it goes to the batteries. In all this handling the ore necessarily becomes thoroughly mixed.

An analysis of the assay value by railroad and battery samples compared with the bullion returns on the lot of 338.72 tons of Hale & Norcross ore worked at the Brunswick mill in October, 1895, furnished an illustration of the unreliability of samples, even of battery samples, if improperly taken. While there was extracted of the silver in the ore 66.01% by railroad sample and 73% by battery sample, there was obtained in the bullion of gold 140% by railroad sample and 153.45% by battery sample. The impossible per cent of yield of gold, even from the railroad sample, will bar one from claiming that the battery sample was too low in gold on account of the gold remaining in the mortar until the final clean-up.

The excessive percentage is due, possibly, to incorrect assay returns. The foreman of the mine testified that the ore was of a different character from what is found elsewhere in the mine, and probably contained a larger proportion of gold to silver than ordinary ore. It is well known that when ore contains free gold, large discrepancies may occur in duplicate assays from the same finely powdered pulp.

One of the main discussions before Judge Hebbard was as to the different percentage of bullion obtained from the ore of different mines and even of different ore-bodies in the same mine on the basis of the car sample and battery sample assays. An erroneous impression was given to many that this was due to the milling, while in fact it was due mainly to the difference in the relative proportion of gold to silver in the ores and to the difference in the minerals comprised in the ores.

It is more difficult to obtain a high percentage from silver ores than from gold ores, the latter being free and uniting quickly with quicksilver, whereas silver is combined with sulphur and other substances and must be first reduced by chemicals before it will unite with quicksilver, and the gangue of the ore often acts upon the chemicals used, destroying their efficacy. In some of the mines the bullion consists of one third gold and two thirds silver, whereas in others the proportion is reversed; in some cases even 80% being gold. Therefore, the per cent of extraction of gold and silver may be equal, but the total percentage will vary. From 80% to 90% should be obtained of the gold and about 45% of the silver in ordinary work on the Comstock.

To illustrate this, take one-ton samples of $40 rock from two Comstock mines, one with 80% of gold and 20% of silver, and the other 30% of gold and 70% of silver. Suppose that in working them there is obtained in each case 80% of the gold and 45% of the silver. From the first lot, containing $32 in gold and $8 in silver, we would obtain $25 60 in gold and $3 60 in silver, or a total of $29 20, which is 72% of the $40. From the second lot we would obtain $9 60 in gold and $12 60 in silver, or a total of $22 20, which would only be 54% of the $40 in that ore. This accounts for the different percentages obtained in the yield from different mills from working ore from different bonanzas.

In the Comstock there were different bonanzas, or ore-bodies, which differed as to the gangue as well as to the minerals composing the ore. The presence of rebellious metals and the difference in the mechanical condition of the ore-bodies make it almost impossible to foretell closely what the yield in per cent will be from any given ore-body in comparison with any other ore-body, or even, sometimes, of different portions of the same ore-body.

This may be illustrated by the results obtained by Mr. Janin from two lots of slimes worked by him on the Comstock and referred to by Raymond in his "Mineral Resources for 1872." From one lot the percentage of gold extracted was 23.30 and of silver 35.68. From the other lot he obtained 76.28% of the gold and 87.06% of the silver.

It may be interesting to note here some of the points in Judge Hebbard's decision upon which the case was sent back for rehearing.

There were delivered to mill by the Hale & Norcross, 88,887 tons gross weight. Based on this weight the gross value of the ore was $3,505,361, or an average assay value of $39 43 per ton by car sample. Allowing for 6% moisture, there were only 83,553.78 tons dry weight, which, at $39 43 per ton, gives a gross value of $3,294,525. The yield in bullion, based on wet weight, was 52.11% of the gross value by car sample; based on dry weight, it was 55.45% of the assay value. The estimated value of the dry ore by car sample being $3,294,525, and allowing that 5% of the value went off in slimes (the per cent of weight going off in slimes would have been greater, but the slimes are usually poorer, especially in gold, than the original ore), there went into the pans ore containing $3,129,798.

Judge Hebbard decides that there should have been returned in bullion $2,616,491. To obtain this would have required an extraction in the pans of 83.6% of the car sample assay, which he admits the testimony showed to be always too high.

Supposing the car sample assay of the Hale & Norcross ore to have been $5 too high, and Judge Beatty also says that the testimony shows that they are always too high (referring to Mackay's testimony that they usually run from $8 to $10 per ton above the real value), and consequently that the real value per ton was $34 43; then the gross value of dry ore would have been 83,553 tons at $34 43, or $2,876,729. Allowing that 5% of this value ran off in slimes, there would have gone into the pans ore assaying $2,732,892, and the $2,616,491 which Judge Hebbard says should have been returned in bullion, would have required an extraction of 95% in the pans. Judge Beatty assumes that Judge Hebbard has roughly included the yield of the slimes and concentrates, etc., in what should have been the bullion yield. This, however, would still make necessary an extraction of over 90% in the pans, or there would have to be credited to the mill the cost of reworking the slimes, tailings, etc., which would not be covered by the charge of $4 50 per ton allowed as the actual cost of working the ore.

It is necessary for the Comstock millman to extract in bullion at least 75% of the battery assay to make good his guarantee of 65% on wet ore, and allow for loss of slimes. Ore is now worked to a higher percentage on the Comstock than was formerly the case, and it is the custom to grind much longer.

The improvement of the working of Comstock ores lies in the direction of working directly the whole amount of ore as it comes from the battery without separating the slimes, and on accomplishing to a great extent by chemical means what is now less perfectly effected by prolonged grinding of the ore at an unnecessary expense for fuel, castings, and quicksilver, the consumption of the latter being increased by the continuous grinding in the pan.

A better system of sampling is now especially desirable on the Comstock, on account of the working of lower grades of ore, where a slight error may entail a loss by causing the milling of ores that will not pay. It is said that Mr. Keating proposes to put up mills to handle large quantities of this class of ores down on the Carson River as soon as the Hale & Norcross suit is settled. When working low-grade ores the mine-owners must necessarily be very careful, for fear of sending to the mill any that will not pay, for the margin between profit and loss is small.

A charge made in the Hale & Norcross case, and one that has too often been made before, is that of causing a great deal of ore that would not yield a profit to the mines to go through the mills simply for the sake of the milling profits.

When thorough, reliable sampling is done, the mill-owners will be satisfied, the mining stockholders will be satisfied, and a blot will be removed from the escutcheon of the mill-barons of the Comstock.

The remedy is simple and at hand, and only awaits adoption by those in power on the Comstock. Mechanical samplers have been so perfected that their use has given entire satisfaction in other districts, both to the mine-owners and the mill-owners where custom work is done. The rapidity with which ore is extracted on the Comstock precludes the idea of hand-sampling. There need be no objection, however, to mechanical samplers, which can handle any number of tons. These could be conveniently placed at the mine under crushers above separate ore-bins, and a given proportion of the ore delivered in cars might be run to the crushers. Falling thence the ore might pass through the samplers, which can be arranged to deliver any percentage required of all the mass passing through them. For instance, ten carloads out of every hundred might be delivered to the crusher, and all of this would pass through the mechanical ore-sampler, which would deliver as small a lot as desired—say half a ton—the other nine and one half tons going on to the mill. From the smaller lot quartered down the assayer would take his sample.

A WATER-POWER AND COMPRESSED-AIR TRANSMISSION PLANT FOR THE NORTH STAR MINING COMPANY, GRASS VALLEY, CAL.

By Arthur De Wint Foote, M. Am. Soc. C. E.

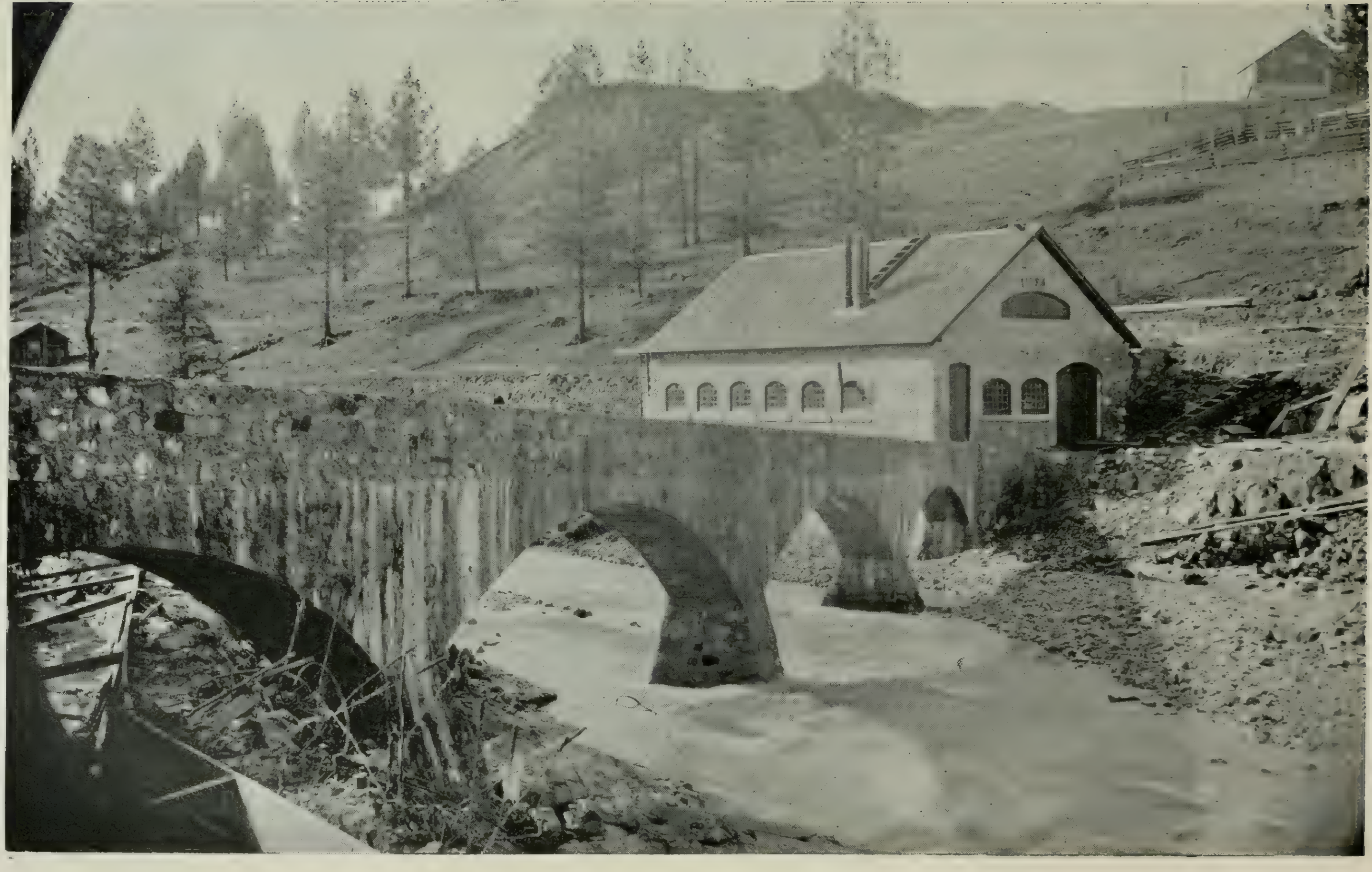
Presented at the Annual Convention, 1896, of American Society of Civil Engineers.

Upon the prohibition of hydraulic mining by the State of California, the immense canal systems extending over the western slopes of the Sierra Nevadas were left without a purpose, and their future existence depended upon a new use for water. Out of this necessity has grown a business of selling water for power and irrigation, retaining the original methods of delivery at the bank of the canal and miner's inch measurement. The price of water is approximately 1 cent per 1,000 gals. delivered at the canal; its cost for power depends upon the pressure that can be obtained from it. In the case of the North Star plant, it could have been conveyed directly to the mines and have done its work there on different wheels more or less adapted to the varying conditions; but there is a certain inconvenience and danger in using water in this manner under a high pressure, and, moreover, the mines are on a hill. So it therefore seemed advisable to convey the water directly to the lowest convenient point, obtain the power there, and transmit this power to the places where it was needed.

This brought forward the subject of transmission of power, and electricity was naturally suggested first. Visits to mines in operation and careful study and investigation of electrical appliances for underground work, especially pumping, finally decided the author in favor of compressed air. The latter method, under the conditions, was believed to be most economical of power, least liable to accident, and cheapest in first cost. Moreover, almost absolute security against stoppage could be obtained by having a set of boilers on hand ready for firing up in case the water-power or air-plant gave out, for, by the use of these boilers and opening and shutting a few valves, all the air-motors become equally good steam-motors; whereas, with electrical transmission an entire set of steam-motors would have to be provided to give equal security; or, as the air- and steam-motors are the same, the electrical-motors would require just so much extra expense in cost of plant of equal security against stoppage.

To give as briefly as possible a distinct idea of this work, a concise description of the whole plant is first submitted, followed by the detailed presentation of its several parts, and finally, the results obtained after careful tests during three months of actual working.

The water-supply is obtained from the South Yuba Water Co., at a point on their canal about 4 miles from Grass Valley, Nevada County, Cal. Thence it is conveyed about 2½ miles to the Empire Mining Co.'s works in a 22″ riveted iron pipe, built more than ten



Compressor House, North Star Mine.

years ago. The new conduit is a riveted steel pipe, 20″ diameter, joined to the lower end of this old one under a head of 420′ and continues 7,070′ to the power-house, situated at the lowest convenient point on Wolf Creek, just below the town of Grass Valley, where a head of 775′, or a static pressure of 335 lbs. per square inch, is obtained. The capacity of this pipe is sufficient to develop 800 to 1,000 H.P.

At the power-house there is a Pelton water-wheel 18′ 6″ diameter, running on a 10″ shaft, to which a duplex compound air-compressor is connected directly. The initial cylinders are 18″, and the second cylinders are 10″ in diameter, with a 24″ stroke. They were designed to run at 110 revolutions per minute, and require 283 H.P. from the water-wheel.

A 6″ lap-welded pipe conveys the air at 90 lbs. pressure from the power-house to the company's Stockbridge shaft on Massachusetts Hill, 800′ distant and 125′ higher. Here it is now being used in a 100 H.P. cross-compound Corliss pneumatic hoisting engine, and a 75 H.P. compound pump, besides other pumps, blacksmith forge, drills, etc.

The Pipe-Line.—The line of the pipe is quite crooked, both horizontally and vertically, partly because it was necessary in locating it to follow a county road. The trench was dug with plows and scrapers, except where too stony, and the joint holes were dug by hand. The joint holes cost fully as much as the trench, for the reason that many of them reached down to the harder and rockier stratum below the soft surface material. The trench was about 10′ wide on top, 4′ to 5′ on the bottom, and 4′ deep. The joint holes were 4′ to 5′ long and 3′ deeper than the trench. The total cost of all the work of burying the pipe, including covering a large portion of it with stone from the mine dumps, and cement masonry wells for the valves and for sustaining the pipes around bends, amounted to approximately $6,756 27. This was done on company account, after refusing bids, the lowest of which would have amounted to about $8,500.

An aqueduct of cement masonry across Wolf Creek at the power-house is not included in this estimate, but was built on company account. It was first built up to grade; the pipe was then laid upon it and afterward covered, so that the pipe is now in the center at the tops of the arches, where the masonry section is 4′ square. The piers of this aqueduct are carried down to the bedrock of the creek some 8′ or 10′ below its water-level. The lower portion of the center piers was built up of cement concrete, but the remainder of the bridge is built of the rough stone hauled from the mine dumps in the vicinity, and Portland cement and sand mixed one to three. Very little hammering was allowed, mortar being cheaper than masons. The center arches are of 33′ span, and the other two of 24′ and 28′; the length of aqueduct over all being 153′. The rock and sand each cost 75 cents per yard delivered; common labor, $2 50 per day; masons and foreman, $4 per day. The entire cost of the bridge was $1,435; as it contains about 180 cu. yds., the cost per yard was about $8. It is thought that this will prove cheaper in a few years than any other mode of carrying the pipe across the creek. Wood or even iron would be subject to more or less change of form, sufficient to cause leakage in the pipe, but it is believed that the pipe buried in the masonry, when once tight, will never have movement enough to cause leakage. In any case, it is probable that a wooden truss bridge with stone piers would have cost nearly as much as the stone. It should be mentioned, however, that the lumber for centers is not included in the cost in this case as it could be used equally as well afterward in the mine.

The steel slabs for the pipe were furnished by the Pennsylvania Steel Company. The Central Mills of Harrisburg rolled the plates, and only seven sheets of the entire lot were rejected by the inspector. The Risdon Iron and Locomotive Works of San Francisco manufactured the pipe from the 48″x 66″ sheets and laid it complete in lengths of about 28′ in the trench under the following schedule, the longitudinal seams being double riveted by hydraulic riveters:

Head.	Length.	No. B. W. G.	Thickness.	Rivets.	Remarks.
420′ to 500′	2,320′	9	0.148″	$\frac{3}{8}''$	Cold riveted.
500′ to 600′	2,110′ 6″	8	0.165″	$\frac{3}{8}''$	" "
600′ to 700′	1,158′	7	0.180″	$\frac{7}{16}''$	" "
700′ to 750′	1,204′	6	0.203″	$\frac{1}{2}''$	Hot riveted.
750′ to 775′	285′	5	0.220″	$\frac{1}{2}''$	" "
Receiver.	40′	---	0.375″	$\frac{9}{16}''$	" "

The specifications required a mild and very tough steel, and the cold flat bending test was insisted upon for all thicknesses. The pipe was dipped, after being made into lengths, into the usual hot asphaltum mixture, and then shipped by rail to Grass Valley and delivered along the trench in wagons. It was then rolled into the trench, and the lengths riveted together in place. Where there was no change in direction a slip joint was made by raising the outer end of the length with a small hand derrick, slipping the upper side into the completed portion, and catching it there through the rivet holes with bolts. Then by lowering the outer end, the weight forced the length into its place with a little care and guidance by chisels, when it was bolted ready for the riveters. Where there was a change in direction, bands were put on in two halves, lapping, but no bend piece or band was allowed with more than 4″ difference in width between the inside and outside. Where hot rivets were used a $\frac{3}{4}''$ hole was punched in the top of the pipe near the end, through which the hot rivets were dropped to the holder-on inside. This hole was afterward stopped with a $\frac{3}{4}''$ gas-pipe plug. P. & B. paint was used to cover all points not protected by the original asphaltum mixture, because it was considered preferable to the hot mixture when put on the cold metal.

In filling the pipe with water, it was quite a delicate operation to let on the full pressure at the Empire gate, as it added 180 lbs. pressure per square inch the instant the lower 7,000′ became full. It was done several times by keeping open a valve at the lower end of the pipe, while the Empire gate was allowing a little more to pass than the lower valve allowed to run away. In this way the pressure was not raised more than 10 or 15 lbs. above the normal. Numerous very small leaks appeared in the pipe under pressure, but neither then nor since has there been a defective rivet or plate. Fine dust from the wagon road was put into the pipe in considerable quantities, which stopped most of the smaller leaks or sweating. The attempt was made at first to mark the larger leaks, and then take off the pressure and calk them, as in the case of a steam boiler. It was soon found, however, that they would appear again as soon as the pressure was returned. Since the leaks have been calked under pressure, using proper care not to strike heavy blows, all trouble has ceased. For a time, owing to an imperfect gate at the Empire, the pressure was raised 60 to 90 lbs. almost instantly many times a day, and in consequence small leaks developed, though they were easily calked.

Close watching was necessary, however, as a stream no larger than a hair, if it happened to be turned along or against the pipe, would, with the aid of the sand it washed in, cut the pipe badly in a few hours. In one instance, two threads of water, so small that they failed to wet the earth upward to the surface, shot out at right angles to each other, one from the longitudinal seam, and one from the circular seam near their intersection. These streams, striking each other, formed a miniature whirlpool, which bored a hole through the pipe about the size and shape of the point of a lead pencil, letting out a larger stream, which soon led to its discovery. Where sharp bends were necessary, the pipe, as laid in the trench, was packed on the outer side of the bend by grouting and cement masonry between the pipe and the side of the trench for the full thickness of the pipe.

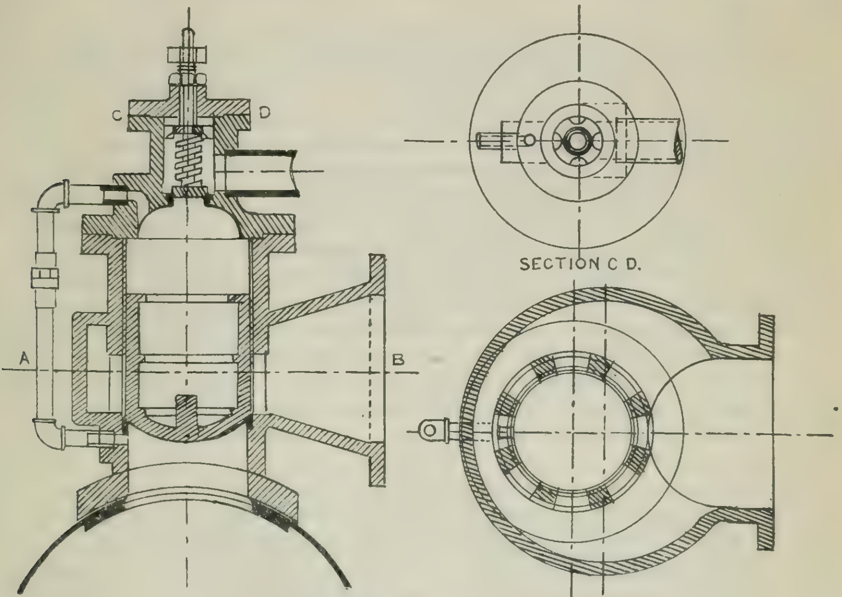


Fig. 1.

About 1,000′ from the lower end a 12″ branch with a gate is put in for possible future use, and adjoining it on the lower side a 20″ gate. These are buried in cement masonry, to prevent any movement from thrust when the latter gate is closed, and over all is built a cement masonry gate-house 12′ square, which answers also for a tool-house. At the lower end of the pipe in the power-house there is another 20″ gate, below which is a 12″ branch leading to the Pelton wheel, and adjoining this is the receiver, 2′ in diameter, on which are the air-chambers, charging-tube, and relief valve. The lower end is stopped with a flanged end bolted on, which can easily be removed for extending the receiver for additional power.

The air-chamber is a 10″ lap-welded tube 18′ long, standing on the receiver, with an 8″ gate between. The charging tube is similar, but 8″ in diameter. Both have 2″ water discharge pipes and gates, and by proper manipulation of the gates and the operation of inlet check-valves on top of the tubes, the air-chamber may be filled. Ordinarily the charging-tube is filled up to 90 lbs. pressure from the air-compressor delivery pipe, and then raised by the water pressure. It is found necessary to put in about one tenth of the volume of the air-chamber every day. Where the air goes is, thus far, a mystery, as no leak has been discovered.

The relief valve was designed by Mr. H. Schussler, Chief Engineer of the Spring Valley Waterworks of San Francisco, and is the first of its kind ever made. It is shown in Fig. 1. It seems perfect for the purpose, except that the small pop-valve leaks continually. It is hoped that this fault may be remedied by using a different form of valve. It can be set to open at about 35 lbs. above normal, and will close without jar or hammer. In action, the pressure rises until it lifts a pop-valve in the ordinary way; when this is raised the pressure is relieved on top of an 8″ piston, slightly larger at the top end, which rises and opens the ports of an 8″ outlet. The pressure going down, the pop-valve closes and equalizes the pressure on both ends of the piston, gradually closing it. If the proper pop-valve can be procured, this relief valve will prove a sure safeguard for the pipe. On one occasion already, when from some unknown source a piece of driftwood entered the nozzle and stopped the flow of water instantly, this relief valve saved the pipe from serious shock, if not actual bursting.

Water-Wheel.—The demand for direct action under a head of 775′ made a large wheel necessary in order to obtain the proper peripheral speed of half the spouting velocity. The manufacturers objected seriously to undertaking anything over 15′ in diameter; whereas the proper speed of 60 to 70 revolutions for the compressors required a wheel of nearly 30′ diameter. A compromise was finally made with a wheel of 18′ 6″ diameter, and a compressor revolution of 110 per minute, and the Pelton Water-wheel Company, of San Francisco, built the wheel from a design by Mr. E. S. Cobb. Had the design been prepared sooner, the wheel could have been made 30′ in diameter equally well. The Pelton Company guaranteed an efficiency of 85% at full load, and an average of 75% from half to full load, of the theoretical power of the water, and, at the same time, to so govern the wheel that it should not exceed 120 revolutions nor raise the air pressure above 105 lbs. per square inch in case of accident to machinery or sudden shutting off of air. The rim is built up of angles and plates riveted together to break joints. It weighs about 6,800 lbs., and is held concentric with the shaft by 12 pairs of radial spokes of 1¼″ rod iron held by nuts to the cast-iron hub. The driving force, being applied to the rim, is transferred to the hub by four pairs of 2″ iron rods, so arranged as to form a truss. Without going into the calculations for strains, which are given as furnished by Mr.

Cobb in Appendix No. 1, it may be stated that the factor of safety is very large for all the strains likely to come on the wheel.

The wheel is set on a 10″ shaft, having a disk crank on either end connected directly to the compressors. The wheel was easily lined up by the nuts on each end of the radial spokes to run almost perfectly true. After a few weeks' use it was found to have worked slightly and was straightened again. It balanced so well that upon shutting off the water it was 14½ minutes coming to rest from 110 revolutions per minute, when disconnected from the compressors. The regulator is a floating valve actuated against excessive velocity by the ordinary ball governor, and against excessive air pressure by a spring set to move when the air pressure in the delivery pipe exceeds 90 lbs. This floating valve admits water on either end of a hydraulic piston which operates a lever moving a hood up and down over the head of the nozzle, thus shutting off or letting the water on to the wheel as the air pressure becomes too great or as the speed gets above or below 110 revolutions. This regulator has now operated the wheel for several weeks and seems almost human in handling its speed. The load can be thrown off entirely and the governor will hold the wheel to 120 revolutions or less, and if all the air-motors happen to be shut down the air pressure will increase rapidly and the wheel slow down, until at 100 lbs. it will stop.

The compressors are so arranged, as will be shown farther on, as to admit of being run at one quarter, one half, three quarters, or full power. It was quite an object, therefore, to have a water-wheel which would give as nearly as possible the full efficiency under these different heads. For this purpose there are four nozzles, one for each of the heads required, and, as the machine must be stopped to change its capacity from one load to another, it is no great inconvenience to change nozzles at the same time, requiring perhaps three minutes. It was of considerable interest to know just what the efficiency of so large a wheel might be, and it was also necessary to measure the water quite accurately for business purposes; therefore, a measuring flume 18′ long and 6′ 9″ wide was constructed to take the tail water on leaving the building. The overflow is a sharp-edged iron about 3″ high and 15″ above the bottom of the flume. No contractions are made. An 8″ pipe about 6′ above the overflow connects with the gauge-box, within which is the measuring scale for the hooked gauge. Great care was used in making the whole apparatus as perfect as possible, and it is believed that the average result of many measurements is within 1% of being correct. The power developed by the wheel was found by taking a large number of indicator cards from the compressors. These were averaged and the friction added, which was found by first running one compressor and afterward running it with the other compressor with the valves out; the difference in the quantity of water used was measured, and the horsepower of this water was called two thirds of the friction of the machine when loaded, which was equivalent to allowing 50% for load. The friction of the water-wheel and its bearings is included in its efficiency. Repeated tests which checked very closely give the wheel an efficiency of a trifle over 90% for one quarter, one half, three quarters, and full loads. Between these points it is somewhat less, as the hood coming down over the nozzle tends to deflect the water as well as hold it back, and decreases the efficiency. It seems probable that the long radius of the wheel accounts for the high efficiency.

The illustration of the wheel shown in Plate X was taken before the wheel was tried. The buckets were soon found to be too near together, and one half of them were taken off. Actual working has shown that this wheel has great efficiency at low speed. It began working under half load, using the half-load nozzle. Gradually in pumping out the mine, as the pumps were lowered and more power was needed, the limit of the machine while running one compressor at 110 to 115 revolutions was reached, and the opposite compressor was connected on, the intention being to run three-quarters load with the three-quarters nozzle. As an experiment, both compressors were connected as if for full load, and the half-load nozzle was retained. The result showed considerable more power delivered with both compressors running at 54 to 65 revolutions than was obtained before with one compressor at 115 to 120, so much, indeed, that the works were kept running over two weeks longer with the half-load nozzle, though the pumps were lowered on an average of 18″ per day. Of course, a large portion of the gain in power can be attributed to the saving in friction and improved working of the compressors under the slow motion, but yet it must be true that the wheel loses very little in its efficiency, compared with the accepted ideas of loss in wheel efficiency, working under a peripheral speed of one quarter of the spouting velocity.

Compressors.—Mr. E. A. Rix, of San Francisco, who has made a careful study of air compression, designed the compressors, and they were built by the Fulton Engineering and Ship-Building Company of San Francisco. They are made very heavy, to stand the high piston speed required by the conditions of the water-power. Had it been known at the time of designing this plant that a wheel could have been made like the one described, a diameter of 30′ instead of 18′ would have been chosen and the piston speed of the compressors reduced accordingly, for there is no question but that 60 to 70 revolutions will do better work than 110. The compressor cylinders are 18″ and 10″ in diameter and 24″ stroke, with a water-jacket so arranged that two streams of water pass around the cylinders in opposite directions. The inlet valves are of the Brenner pattern and open directly into the power-room. Mechanical valves and air inlets from the wheel-pit were considered, but taking into consideration the class of mechanics likely to handle the machine, and its remoteness from the shops, it was decided to adopt the simplest valves and place them so as to be reached easily. The compressor cylinders were made sufficiently large to allow for the rarefaction of the air caused by the automatic valve, and all the air that enters the building is forced to come up through the wheel-pit. The other valves are made after the pattern of ammonia compressors.

The most novel feature of these machines is the intercooler. This is made up of 49 soft copper pipes, 1″ in diameter, 18′ long, each with a stuffing-box at each end connected with manifold castings. The air delivered from the first cylinder into one manifold passes through these pipes to the other manifold, from which it is taken to the second cylinder. The whole is placed in the wheel-pit directly under and in front of the wheel, so that the water dashes all over and through it. The air leaving the first cylinder at a temperature of 200° F. passes through the intercooler and enters the second cylinder at 60°, slightly cooler than when entering the first cylinder. The temperature is again raised to 204° on leaving the second cylinder and passing into the transmission pipe, showing a total rise in temperature of 282° F.

The transmission pipe, conducting the air at 90 to 100 lbs. pressure about 800′ from the compressors to works at the mine, is ordinary well tubing 5¾″ in diameter inside, screwed together in the trench and bent to fit the uneven ground by building fires around it and heating it until its own weight shaped it to the surface. After being laid and covered, it was tested by filling it with water under 120 lbs. pressure, which was allowed to stand over night. No leakage was discovered and none has appeared since. As yet only half of the full load of air has been passed through this pipe, so no data of value regarding loss in transmission through pipes have been obtained. With the present load the difference in pressure between the power-house and the mine is not sufficient to be detected on the ordinary pressure gauge. At the mine there is the ordinary air-receiver and also three 50 H.P. boilers set ready for steam, which are used for receivers.

The air is taken from these into the reheaters designed by Mr. Rix and built by the Fulton Company. As these are the first of their kind, it may be said they have proved remarkably well designed for their work. Experience has shown, however, that slight improvements can be made which would save fuel. At present it requires a little over half a cord of good pine wood each twenty-four hours to heat about 700 cu. ft. of free air per minute to a temperature 350° to 400° F.

The heated air passes through pipes covered with magnesia and hair-felt to the first cylinder of the hoisting engine, from which it is exhausted back into the upper heater, where its temperature is again brought to 350°, whence it passes to the second cylinder at 30 lbs. pressure. From this it is exhausted through a flue to the change house, where it is used for heating and drying clothes. From the first heater also the air for the pump is conveyed some 300′ down the shaft in a similarly covered pipe. The pump was designed and built by Mr. George E. Dow, of San Francisco, and is a tandem compound vertical sinking pump of a capacity of 500 gals. 300′ high per minute. It receives the air at about 275° and exhausts it into the shaft at about 60°, thus giving plenty of pure cool air to the men, without the usual fans or ventilators. At the present writing, this pump is throwing 600 gals. per minute 240′ high.

In addition, there is a direct-acting donkey pump throwing 350 gals. 110′ high situated in another shaft 750′ distant, to which air is carried cold in a 2″ pipe over the surface. An old hot-water heater is used as a reheater for the air, and consumes 12 sticks of pine cord wood per twenty-four hours.

The hoisting engine is a compound, direct-acting Corliss of 100 H.P., with cylinders jacketed for hot air, and is calculated to work 3,000′ down an incline of about 35°. This was also designed by Mr. Rix and built by the Fulton Company. While it is especially adapted to the use of heated air, it takes steam as well as any engine, and in fact was first tested with steam.

Efficiencies.—Efficiencies often seem to depend largely on the personal equation of the reporter. Mr. Rix's summary of tests is given in Appendix No. 2. He spent a number of weeks making them, and while agreeing with him in the main, the following are submitted as the author's conclusions. In any case, the plain tale is this. There is 304 theoretical H.P. in the water used at the power-house, the work actually accomplished at the mine amounts to 203 H.P., and the cost of reheating is $3 per day.

Efficiency of compression and transmission from water-wheel to motors, and not including cost of reheating	$\frac{225.32}{283}=79.5\%$
Efficiency of compression and transmission from theoretical power of the water to the motors, and not including cost of reheating	$\frac{225.32}{304}=74\%$
Efficiency from the water-wheel to and through the motors, not including reheating	$\frac{202.7}{283}=71.6\%$
Efficiency from the theoretical power of the water to and through the motors, and not including the cost of reheating	$\frac{202.7}{304}=66\%$
Efficiency of compression and transmission from water-wheel to motors, including the cost of reheating expressed in water-power	$\frac{225.32}{307.66}=73\%$
Efficiency of compression and transmission from the theoretical power of the water to the motors, including the cost of reheating expressed in water-power	$\frac{225.32}{329}=68{\cdot}4\%$
Efficiency of compression and transmission from the water-wheel to and through motors, including cost of reheating expressed in water-power	$\frac{202.7}{307.66}=65.5\%$
Efficiency of compression and transmission from the theoretical power of water to and through the motors, including cost of reheating expressed in water-power	$\frac{202.7}{329}=61.6\%$

Horse-power of air at works after reheating: 225.32.
Horse-power delivered to compressors by water-wheel: 283.
Theoretical horse-power of water used on the wheel: 304.
Horse-power of work actually done by the motors: 202.7.
The horse-power delivered by the water-wheel to the compressor, to which is added the horse-power (24.66), which the cost of the wood used in reheating would buy in water: $307.66 = 283 + 24.66$.
The theoretical horse-power of the water used on wheel added to the horse-power (24.66), which the cost of the wood used in reheating would buy in water: $329 = 304 + 24.66$.

After nearly three months' working of the plant, the author believes the results obtained demonstrate the wisdom of having chosen air instead of electricity.

It may be urged that the conditions are particularly favorable to compressed air, as the transmission is short and the power is not needed for tramways or lighting. For lighting it is admitted without question, and possibly for tramways, that electricity is preferable, but for transmission, were it 20 miles instead of 1,000′, it is thought by the author that, taking the whole plant, compressor, transmission pipe, and motor, as against generator, transmission wires, transformers, and electric motors, the air will prove cheaper in first cost, higher in efficiency, less liable to accident, and less expensive to operate and maintain.

The sense of being solidly supported in his plans and expenditures and encouraged to make his work thorough by the money power behind him, is so rare in the experience of the American engineer as to be worthy of grateful mention; but still more rarely does he find, united to this material backing, the moral support which comes of the comprehension and sympathy of a wise engineer. This was the great good fortune of the author in carrying out the decision in favor of compressed air transmission and other somewhat novel features of the plant, under the sanction of Mr. James D. Hague, the President of the North Star Mining Company.

APPENDIX No. 1.

THE PROBLEM OF THE WHEEL.

By E. S. COBB.

The problem is to design a wheel, the total weight of which is to be 10,000 lbs., as nearly as possible, the diameter 18′ 4″, the rim of suitable section to receive the buckets of a Pelton water-wheel, and the whole strong enough to be in continuous use at 110 revolutions per minute while transmitting 226 H.P. from rim to shaft.

The cross-section of rim adopted is shown in Fig. 2. It is made up as follows:

Two 6″x 4″x ⅝″ angles, weighing 20 lbs. per foot, 40 lbs. per foot of rim.
Four 4″x 4″x ⅝″ angles, weighing 15½ lbs. per foot, 62 lbs. per foot of rim.
Center plate ¾″ thick, 28 lbs. per foot of rim.

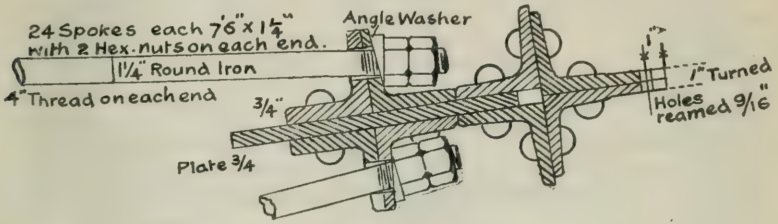


FIG. 2.

The mean diameter of the rim is 16′, and the average weight per foot is 135.2 lbs., including rivet heads. The total weight of the rim is 6,800 lbs.

The rim is held concentric with the shaft by twelve pairs of radial spokes. Strictly speaking, however, these spokes are at a slight angle with the plane of revolution, and this angle is taken into account in the calculations.

For the purpose of determining the maximum strain in working that may be expected by one pair of spokes, the rim is assumed to be cut into twelve pieces, each piece weighing 575 lbs., and being held in position against centrifugal force by one pair of spokes. Then the strain on each pair of radial spokes due to the velocity is found as follows:

Centrifugal force $= \frac{\text{weight} \times \text{radius} \times \text{rev.}^2}{2,936}$. Substituting the proper quantities $\frac{575 \times 8 \times 12,100}{2,936} = 18,958$ lbs., or 9,479 lbs. per spoke.

By reason of the position of the spoke at an angle with the plane of revolution, this strain becomes 10,000 lbs. per spoke. As 1¼″ round iron is used, there is at the bottom of threads a safe area of 0.7854 sq. in., or a strain of 12,700 lbs. per square inch of section, on the assumption that these rods hold the whole of the centrifugal force acting in the rim, without any aid from the strength of the rim itself.

The strain at the least cross-section of the rim when it sustains its own centrifugal force without any aid from the radial spokes is as follows:

$$\frac{135.2 \times 8 \times 12{,}100}{2{,}936} = 4{,}458 \text{ lbs.},$$

nearly, per foot of diameter. At 16′ average diameter, the total bursting strain of 71,328 lbs. is held by two sections, or 35,664 lbs. per least cross-section. The least cross-section of the rim is the section of the six angle irons, or 30.6 sq. ins. Deducting 25% for unknown imperfections and rivet-holes leaves about 23 sq. ins. area, giving a strain of 1,550 lbs. per square inch of rim, when it alone is sustaining all the strain due to centrifugal force.

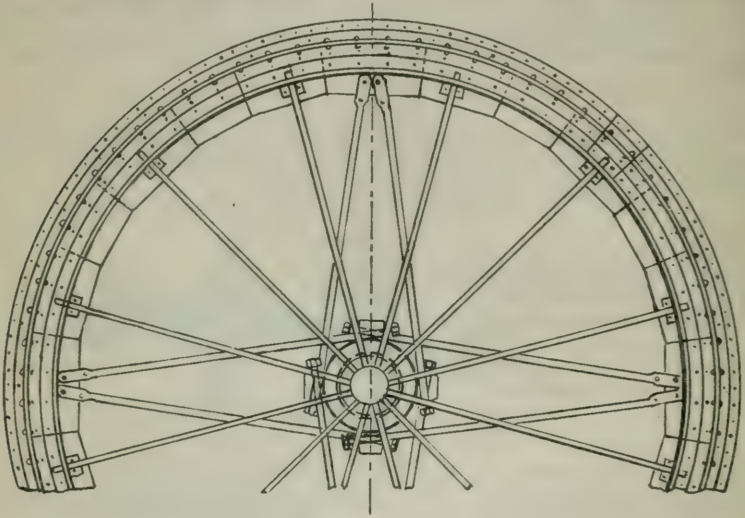


FIG. 3.

Power being applied to rim to develop 226 H.P. at 110 revolutions per minute, there results as the tangential strain at the ends of the truss rods 1,500 lbs., or 375 lbs. tangential strain at the end of each truss rod. This tangential strain produces in the rod, on account of its position, a tensile strain of 2,207 lbs., or 1,100 lbs. per square inch of net cross-section when seven threads are allowed for.

The general form of the wheel is shown in Fig. 3.

APPENDIX No. 2.

SUMMARY OF TESTS OF THE NORTH STAR POWER AND TRANSMISSION PLANT.

By E. A. Rix.

Actual capacity of compressor, 1,412 cu. ft. of free air compressed to 90 lbs. gauge.

Volumetric efficiency, 96.6%, determined as follows:

Barometer pressure, 13.42. At 90 lbs. gauge, compression ratio is $103.42 \div 13.42 = 7.7$. Receiver, air pipe, and all storage, reduced to

90 lbs. gauge, contained 291 cu. ft., which equals 2,240 cu. ft. of free air. Compressor averaged 102½ revolutions to fill this at 90 lbs. from 25 lbs., which was intercooler pressure. Receiver, etc., at 25 lbs. gauge contained 830 cu. ft. free air. 2,240 — 830 = 1,410 cu. ft. delivered by 102½ revolutions; deducting 2% for increase of temperature in receiver makes 1,382 cu. ft. at 60°, the outside temperature. Theoretical capacity of compressor, 1,429 cu. ft. at 102½ revolutions, 1,382 ÷ 1,429 = 96.6 volumetric efficiency. Reduced to 110 revolutions, this gives 1,412 cu. ft. working capacity. To compress this, 304 theoretical H.P. of water was used on 18′ 6″ Pelton wheel, at 110 revolutions.

The indicated horse-power in all the cylinders averaged 250 H.P., and friction load 22 H.P.; total, 272 H.P. 272 ÷ 304 = 90% efficiency for water-wheel.

This friction load was determined when machine had no pressure on it, but was running at normal speed. Experiments on steam compressors show that the friction load is 50% more under full work. This would, then, be 22 + 11 = 33 H.P. friction load, making total of 272 + 11, or 283 H.P. delivered by wheel, or 283 ÷ 304 = 93% of theoretical power in water.

The head of water is 730′ on the wheel.

The work of compression and delivery is 250 ÷ 304 = 82.2% of the theoretical horse-power, or 250 ÷ 283 = 88.3% of horse-power delivered by wheel.

The 1,412 cu. ft. of air is reheated to 350° F., and, considering that it is used in a compound Corliss engine with intermediate reheating, the theoretical potential in the air before use is 225.32 H.P., determined as follows:

The cylinders being jacketed for hot air, the Y which is used in calculations is the same as that used for compound, jacketed compression, viz., 1.3; then

$$Y = 1.3;\ Y - 1 = 0.3;\ \frac{Y-1}{Y} = 0.23;\ \frac{Y}{Y-1} = 4.33.$$

Barometric pressure = 13.42. Outside temperature, 60° F.

The work being equally distributed between the two cylinders, the intermediate pressure will be the mean proportional between the initial and final pressures. Initial pressure, 90 + 13.42 = 103.42. Final pressure, 13.42 + 1 = 14.42 (1 being the exhaust pressure above atmosphere). Then $\sqrt{103.42 \times 14.42} = 38.62$, absolute intermediate pressure. The formula for the work in the cylinders will then be:

$$\frac{\frac{Y}{Y-1}\, P\, V \frac{T_3}{T}\left(1 - \frac{p^2}{p_1}\right)\left(\frac{Y-1}{Y}\right)}{33{,}000}$$

in which the elements are

$$\frac{Y}{Y-1} = 4.33$$

P = barometric pressure per square foot = 13.42 × 144.
V = cubic feet free air.
T_3 = temperature of reheating, absolute = 461 + 350 = 811.
T = absolute outside temperature = 461 + 60 = 521.

p_2 = intermediate pressure = 38.62.
p_1 = initial pressure = 103.42, and

$$\frac{Y-1}{Y} = 0.23.$$

Then substituting, the equation becomes:

$$\frac{4.33 \times 13.42 \times 144 \times 1{,}412 \times \frac{811}{521}\left(1 - \frac{38.62}{103.42}\right)0.23.}{33{,}000}$$

Or 554.96 × 0.203 = 112.66 H.P. in one cylinder, or 225.32 H.P. in two cylinders.

Inasmuch as $3 worth of wood, or its equivalent, 15 inches of water at 20 cents an inch, has to be added for reheating, the following allowance must be made for this: 15 inches of water under 730′ head equals 30 H.P. The work of compression and delivery being 82% of the theoretical horse-power, 30 × 82.2, or 24.66, represents the actual value of power delivered to the air to account for reheating; then, 250 + 24.66 = 274.66 is the total power spent on the air. It has a theoretical potential of 225.32, and consequently 225.32 ÷ 274.66 = 82%. Counting from the theoretical power in the water, the efficiency would be 225 ÷ 304 = 74%.

This 82% represents the efficiency of the compressed air system under unfavorable circumstances. It was deemed advisable to have the water-wheel on the compressor shaft, and $18\frac{1}{2}'$ was the limit of diameter which could be contracted for. This made a revolution speed of 110, and a piston speed of 440, which reached 660′ at the half stroke just when discharge was beginning from the cylinders. These piston speeds are too high for economical work. Running the water-wheel throttled at 80 revolutions, or a piston speed of 320′, the indicator cards showed a horse-power of 247, including the friction load. This would show an efficiency of 225.32 ÷ 247 = 90%, or from the theoretical water-power 225 ÷ 275 = 80%, and were the same plant to be built again this could easily be attained, because it has been ascertained from the experience with the present water-wheel that its diameter can be increased so as to run at 80 revolutions.

What power value will be in this 90% efficiency will depend largely on the motors used. The theoretical potential was calculated on the assumption that compound Corliss, jacketed, double-reheated engines should be used. Allowing that these engines have a mechanical efficiency of 90%, which is not a high efficiency, the horse-power realized will be 90 × 90, or 81% of the indicated horse-power of the compressors, or 90 × 80 = 72% of the theoretical value of the water-power. With other classes of motors, the value of their work can be proportioned to the above percentages directly as their economic value is to that of the compound Corliss motor from which the air potential was assumed.

When the pump was first started it made 71 strokes, theoretically 710 gals., or 5,893 lbs. The pump has a volumetric efficiency of 95%, which would make this quantity 839,752 foot-pounds. This was done with the compressor running at 80, and the air pressure at 90. At the present time, the pump is making 60 strokes or 4,980 lbs., pumping 230′, making 1,145,400 foot-pounds, or, at 95% volumetric efficiency, 1,088,130 foot-pounds. This is being done with 93 single revolutions, at 90 lbs.

The compressor is making 90 single revolutions at an average of 92½ lbs. pressure, which is equivalent to 93 single revolutions at 90 lbs., in order to reduce both the performances to the same pressure.

The difference between the foot-pounds of work in both of these cases, viz., 1,088,130 — 839,752, is 248,378 foot-pounds. The difference in revolutions is 13; consequently 13 revolutions did 248,378 foot-pounds of work, or 19,100 foot-pounds for one single revolution.

It is evident that this work is what the pump is capable of doing, independent of its friction of pipes, etc., because the friction of the pump and the friction of the pipes within the small working limits of this pump are practically the same, as will be seen from the following: For 93 single revolutions, were there no friction of pipes or inertia of pump to overcome, it is evident the pump should perform 93 times 19,100 foot-pounds of work, or 1,776,300 foot-pounds. It really did 1,088,130 foot-pounds, the difference being 688,170 foot-pounds, which is the friction of the pipes and inertia losses.

In the other case 80 revolutions should have done 80 times 19,100, or 1,528,000. It actually did 839,752, the difference being 688,248; again almost identical with the first proposition. So the mean between these two, or 688,209 foot-pounds, is the actual pump loss, and this loss it would seem is almost the same at any head within the working limits of the pump.

The loss now being determined, it is possible to determine what actual work is being done, and if the pump efficiency is determined, a check can be made on the potential of the compressor.

If at 93 revolutions the pump does 1,088,130 foot-pounds of work, and the friction is 688,248 foot-pounds, and 19,100 foot-pounds are added for each single revolution of the compressor up to its limit of speed, viz., 220 single revolutions, this last amount being 2,425,700 foot-pounds, there would result a total of 4,202,078 foot-pounds of work which the pump would do when the compressor is running its 220 single revolutions, or its limit. If there is deducted from this amount the friction and inertia loss of 688,248 foot-pounds, the result is 3,513,830 foot-pounds, which is the usual effort of the pump, and the ratio between what the pump actually does and the foot-pounds of work it consumes would be its efficiency, which, upon dividing these sums by each other, shows the mechanical efficiency of the pump to be 83%.

If the potential of the compressor is 225.32 H.P., and the efficiency of the typical motor is 90%, then the brake horse-power possible for the typical motor would be 225.32 times 0.9, or 202.7 H.P. for 220 single revolutions of the compressor. For one revolution it would be 0.992, which is 30,426 foot-pounds.

The pump actually does 19,100 foot-pounds for one revolution. The ratio therefore between 19,100, which the pump actually does, and 30,426, which the typical motor would be capable of, would be the pump efficiency as compared to that of the motor. This would be 62%. This includes temperature, the friction in pipes, and inertia losses between the reheater and the pump exhaust.

Inasmuch as the pump did 4,202,076 foot-pounds of work with an efficiency of 62%, as compared to the typical motor, the typical motor would yield 4,202,076 ÷ 0.62 = 6,600,000 foot-pounds, or 200 H.P., which compares very favorably with the original calculations for the brake horse-power at the potential as being 202.7.

Recapitulating these figures:

		Foot-Pounds.
The total work done by the pump	=	4,202,076
The total brake horse-power of the ideal motor	=	6,600,000
The total potential of the air after reheating	=	7,434,900
The total work spent on the air, including the energy of reheating at 440′ piston speed	=	9,042,000
The total work spent on the air, including the energy of reheating at 320′ piston speed	=	8,215,000
Theoretical power of the water at 440′ piston speed	=	10,032,000
Theoretical power of the water at 320′ piston speed	=	9,205,000
Total power of the water, including the energy of reheating at 440′ piston speed	=	10,692,000
Total power of the water, including the energy of reheating at 320′ piston speed	=	9,865,000

Under the lower piston speed, which should be the proper speed to run the compressor, the ratio of original power and reheating, 9,860,000 foot-pounds, and the total pump result, 4,202,000 foot-pounds, would be 44%, which would be the efficiency from first to last as far as the pump system was concerned, and the ratio between any other of the elements in the preceding recapitulation will be their relative percentages.

THE COMING MOTIVE POWER.

IS COMPRESSED AIR DESTINED TO BECOME THE RIVAL OF ELECTRICITY?

By Joseph W. Buell.

From "The Inventive Age," Washington, D. C., December, 1895.

Many and marvelous are the inventions which have grown out of electrical discoveries and research, until it seems, from their multiplicity and present state of perfection, that the spirit of invention which animated these creations must soon slumber. Mighty, indeed, has been the revolution in the affairs of man wrought by electricity, under the command of genius, even though its march has been in the wake of that other potent force in civilization—steam. Notwithstanding these achievements, the commercial and industrial world is fast becoming conscious of the fact that its future rapid strides and ultimate commercial supremacy, as a motive power, will depend on cheapening the production of this form of energy, so as to oust steam, which feeds wastefully on costly coal. If this problem remains much longer unsolved, its toiling in the field of transportation, and in the workshop, will be shared by some other of nature's forces, for investors have begun to seriously realize that the millions which have been expended for franchises, dynamos, copper wire, etc., are not fruitful in dividends. It is stated that only one fifth of the electric lighting stations in the United States are paying 4½%. Is it the uneconomical process of generating electricity by the initial power, steam, that is responsible for seventy-four electrical railroads, representing a billion and a half of dollars, being now in the hands of receivers? It is true that dynamos, in their present state of development, give out a high percentage of the engine's power imparted to them, and though we find the latter supplying in mechanical energy only 10% of that represented by the furnace heat, yet this wasteful process is not directly chargeable to the engine's incapacity to transform power delivered to it; but the trouble is due to the inability of the boiler to absorb and convert the major portion of the heat energy liberated in its fire-box. These significant facts have already influenced the recent course of electrical investments, and now the selection of a cheap initial power for generating electricity is the all-important question of the day. Eminent engineers and scientists are at work upon this problem, some endeavoring to produce electricity direct from coal or chemicals by rapid decomposition, or other methods of electro-chemistry, with a view of locating power plants in the coal-fields, or by the sea, and telegraphing the currents so derived to the cities for consumption, while others are seeking sources of energy to be found in water-powers, or in the fitful but giant forces of nature, as tides and winds—and the promise recently given that Niagara would soon be a captured Pegasus and harnessed, so as to become a useful wheel-horse, instead of a prancing, plunging steed, is now fulfilled.

This development of power in the bosom of nature, many miles distant from industrial centers, presents other problems, requiring skill of the highest order, in their solution, namely: the economical transmission and distribution of currents of great magnitude and intense energy over long distances. When large accumulations of electric current are concentrated and prescribed to flow over a conducting wire, it becomes elusive and intractable as it flows forth, and rather than follow the pathway appointed for it to travel, it wastes itself, or passes to other substances and is dissipated so rapidly, that if it is transmitted any great distance the loss becomes so great as to render its transmission impracticable. Thus it can be seen that while electricity has not yet succeeded to its estate, the solution of these problems will mark a new era in the history of this subtle element. The applications of electric energy to industrial and commercial uses are so numerous and varied, and this singular phenomenon has received so much attention at the hands of the scientist, the engineer, and the capitalist, that the world has become fascinated by its conquests, till now the impression prevails that electricity must necessarily become the motive power of the age. The writer does not claim that this, the above tendency, is a false one, but simply is set forth to show the reasons why other available forces in nature have received so little attention and consideration. Among these neglected forces, compressed air may be mentioned as a means of power transmission that has not received the attention it deserves.

EARLY ATTEMPTS TO USE COMPRESSED AIR.

The application of compressed air to industrial purposes dates from the close of the last century, although before this we find isolated attempts were made to apply it in a variety of ways.

To the fertile brain of Dr. Papin, of France, we are indebted for the first suggestion of conveying parcels in a tube by compressed air, and he was the first to suggest the use of compressed air as a means of transmitting power. This distinguished Frenchman went to the expense of putting his ideas into wood and metal, but the results of his experiments were not encouraging. This was about A. D. 1700.

About a hundred years later, a Welsh engineer contrived an apparatus to utilize a water-power to work a blast furnace and machinery, a mile and a half distant, by compressed air, but the resulting blast was feeble.

For a century or more water-elevators operating by compressed air have been used in the mines at Chemnitz in Hungary. Vague descriptions of apparatus for using compressed air in the mechanical arts are found in early English patents and publications, but none, so far as known, were practically applied. In 1810, Medhurst, of England, patented means for conveying parcels by compressed air. There is no authentic record that his project was reduced to practice, and it stands simply as a mile-post on the road toward the advancement of knowledge in this direction. In 1824, Vallance revived the idea of Medhurst. Contributions to this science were also made by such pioneers as Pinkus, Cleeg, and Pilbrow.

In 1837, the Italian government ordered experiments to establish the laws that govern air transmission, and improvements in methods and appliances have followed, resulting in the practical use of air for tunneling, in conveying parcels in tubes, and that valuable adjunct to railway trains—the air-brake.

Along about 1857 an American, Dr. Gorrie, exhibited in London and elsewhere cold-producing machines, in which air was compressed in one cylinder, cooled whilst compressed, and re-expanded in another cylinder, in a manner to utilize its expansive force. In 1859, a company was formed in London, and permanent pipes laid down for conveying parcels by air; these lines of pipe were extended in 1865. During the same year Ericsson operated eighty sewing-machines by compressed air in a factory in New York.

Experimental sections of pneumatic dispatch tube for carrying passengers were built at Sydenham, England, and in New York in 1867. The line at Sydenham was 600 yards long, and was traversed in fifty seconds with a pressure of 2½ ozs. per square inch. In 1872 Congress appropriated $15,000 for a pneumatic dispatch tube between the Capitol and the Government Printing Office in this city.

Other systems have been multiplied by telegraph and express companies in Vienna and Berlin. The Western Union Telegraph Company conveys messages from lower Broadway to Twenty-third Street in New York, a distance of about three miles. They employ a vacuum, and the parcel travels between the terminals ordinarily in five minutes. Air was used for rock-drilling in tunneling Mount Cenis, Hoosac, Arlburg, and other mountains. In 1879 air was used to propel cars on the Second Avenue Railroad, in New York.

This was briefly the state of the art up to 1880, but the dreams of Papin and the hopes of Medhurst were but partially realized. The disappointments of the past are, however, no cause for apprehension of the final successful application of air for transmitting power. Many of the grandest successes of the present were absolute failures in the early attempts. Previous to 1880 the waste of energy in the compression of air, and the sickly design and faulty construction of mechanism for using air, due largely to the ignorance of the principles of thermodynamics, retarded the introduction of air as a mode of transmitting power. At Mount Cenis tunnel, the loss in compression was fully 90%. In the modern compressors the loss is less than 16%.

While compressed air has been used over and over again in a small way, and generally in a rough and uneconomical fashion, it was not until within a few years that any systematic attempt has been made to transmit and distribute this form of power for general consumption. To-day this is being successfully done in Paris and Birmingham, England, where the installations have given birth to applications and utilizations for purposes heretofore unthought of, with valuable economic results, and a realization of high efficiency in its workings.

In Paris the power is distributed not only to factories and electric lighting stations, but also finds domestic use, being sold to householders, restaurant-keepers, etc., keeping them supplied with an available power which is turned to account in many useful ways, in producing the conveniences and comforts of life, while proving a welcome substitute for steam-power, with its heat, smoke, danger, and waste.

The commercial advantages derived from these air systems have resulted in their rapid extension, and in Paris elaborate provision is being made to increase the size of the plant with a view of supplying an aggregate of 25,000 H.P.

THE POWER YIELDED.

The general efficiency of this mode of transmitting power in these two systems is conservatively put at from 80% to 85%, a showing that puts to flight the idea that the transmission of compressed air over a distance of several miles necessarily entails enormous losses. The attainment of this efficiency is gained by the help of another physical agent, in connection with the observance of certain simple laws, and an explanation in regard thereto may be readily understood without wading too deep into the water of science; and when understood will make clear the reasons why heretofore the progress in the introduction of a power so rich in possibilities has been impeded, while the truth becomes apparent that there is very little loss of power through its transmission if properly manipulated. In order that the reader may understand the elements involved in the solution of this problem it is necessary to gain a few preliminary ideas as to the behavior of air under prescribed conditions. Air under compression when impelled to move in a certain path is governed by laws quite different from those affecting electricity. As the air flows through the pipes the resistance of the surface of the same has to be overcome, and whenever compressed air meets resistance the pressure falls slightly, but this moderate reduction in pressure does not involve a loss in transmission, because what the air loses in pressure it gains in volume, so that its mechanical effect may at any point be easily restored to its initial capacity by the application of a small amount of heat, and it has been found that by this simple expedient its capacity to do work at the points of consumption many miles from the power-station is enhanced with but a nominal cost, and that no more economical effect of the application of heat has ever been found than this method of annihilating the effects due to friction in the air's transmission. An eminent English engineer declares that a quarter of a pound of coke per hour per indicated horse-power is sufficient to heat the air required in a moderate sized engine. Nor does this fairly illustrate its economic value, when we come to consider that it is capable of another important service (as alluded to in Dr. Gorrie's discovery) at the points of consumption, in the use of the by-product, the exhaust from the motors—for the purposes of ventilation and refrigeration. In Paris the restaurants and beer-cellars are supplied with refrigerant in this manner and which proves highly satisfactory in every respect and displaces the ice-melting method altogether, and in some cases is so sought after for cold storage that power is consumed essentially for its exhaust to use to this end.

In this country compressed air is being pressed into service in small ways in every branch of industry, but the use to which the public is most familiar is probably in its application to railway trains in its adaptation to applying the brakes; but its utility and operation in this connection are scarcely appreciated until we come to consider the conditions of its use. While we have all noticed that trains cannot be gotten under way until the locomotive has run some distance, to work up speed, it is doubtful if we have ever stopped to think of the tremendous momentum that is being piled up as that speed increases and the energy that must be destroyed in bringing a train to a sudden stop, after it has gotten under way. It is estimated that the vast amount of energy that must be called into action at a moment's notice is greater than can be imparted to a projectile by the largest of modern guns. Its triumph in this direction is daily evidenced, and is the one important factor that has made speed in railway travel reconcilable with safety. How few of us have realized the importance of this daily performance. A train running 40 miles an hour traverses 59′ in each second—lurking danger appears in sight—the loss of one second through the lack of vigilance on the part of the engineer means its hastening on an errand of destruction, by just 59′. By the touch of a lever the brakes are applied and the train that was rushing along at almost lightning speed is brought to a standstill in a minimum of time and within a distance of 400′ from where the danger was sighted, and this prodigious power that is brought to bear on the brakes is so ingeniously distributed and applied as to relieve the cars of all strain, while the train is promptly arrested in its flight without creating any commotion among the passengers or giving rise to a disagreeable shock.

AN ACT

Making Appropriations for the Construction, Repair, and Preservation of Certain Public Works on Rivers and Harbors, and for Other Purposes.

[Passed the House June 2, 1896, and the Senate June 3, 1896.]

For the construction of restraining barriers for the protection of the Sacramento and Feather rivers in California, two hundred and fifty thousand dollars; such restraining barriers to be constructed under the direction of the Secretary of War in accordance with the recommendations of the California Debris Commission, pursuant to the provisions of and for the purposes set forth in section twenty-five of the Act of the Congress of the United States, entitled "An Act to create the California Debris Commission and regulate hydraulic mining in the State of California," approved March first, eighteen hundred and ninety-three; *provided*, that the Treasurer of the United States be, and he is hereby authorized to receive from the State of California, through the Debris Commission of said State, or other officer thereunto duly authorized, any and all sums of money that have been, or may hereafter be, appropriated by said State for the purposes herein set forth. And said sums when so received are hereby appropriated for the purposes above named, to be expended in the manner above provided.

FIFTH BIENNIAL REPORT

OF THE

STATE BOARD OF HORTICULTURE

OF THE

STATE OF CALIFORNIA,

FOR 1895-96.

SACRAMENTO:
A. J. JOHNSTON, : : : : SUPERINTENDENT STATE PRINTING.
1896.

CALIFORNIA

STATE BOARD OF HORTICULTURE.

ELLWOOD COOPER, President .... Santa Barbara.
Commissioner for the Los Angeles District.

MARK L. McDONALD, Vice-President .... Santa Rosa.
Commissioner for the Sonoma District.

FRED C. MILES, Treasurer .... Penryn.
Commissioner for the El Dorado District.

RUSS D. STEPHENS .... Sacramento.
Commissioner for the State at Large.

FRANK A. KIMBALL .... National City.
Commissioner for the State at Large.

SOL. RUNYON .... Courtland.
Commissioner for the Sacramento District.

BEN M. MADDOX .... Visalia.
Commissioner for the San Joaquin District.

A. BLOCK .... Santa Clara.
Commissioner for the San Francisco District.

FRANK H. BUCK .... Vacaville.
Commissioner for the Napa District.

B. M. LELONG, Secretary .... Ex officio Chief Horticultural Officer.
ALEXANDER CRAW .... Quarantine Officer and Entomologist.
ELLA F. HALLAHAN .... Clerk.

OFFICES:

STATE CAPITOL SACRAMENTO, CAL.

Branch Office:

CLAY-STREET DOCK, SAN FRANCISCO.

CONTENTS.

PAGE.

REPORT OF STATE BOARD OF HORTICULTURE TO GOVERNOR 1–63

REPORT OF B. M. LELONG, SECRETARY AND CHIEF HORTICULTURAL OFFICER.. 67–116

REPORTS OF ALEXANDER CRAW, QUARANTINE OFFICER AND ENTOMOLOGIST 127–135

PRUNING THE PRUNE—(SPECIAL) 121–124

REPORTS OF COUNTY BOARDS OF HORTICULTURAL COMMISSIONERS 139–161

INDEX 163

ERRATA.

On page 25, for "*canotrachelus*," read "*conotrachelus.*"

On page 25, for "*C. fletcherell*," read "*C. fletcherella.*"

On page 60, for "Pear blister mite," read "Pear *leaf* blister mite."

On page 60, referring to the grade of cyanide of potassium, read "C. P. 98%," instead of "60%."

REPORT.

Office of State Board of Horticulture,
State Capitol, Sacramento, Cal., October 1, 1896.

To his Excellency James H. Budd, *Governor, and the honorable the Senate and Assembly of California:*

In accordance with law, we have the honor to submit herewith our fifth biennial report for the years 1895-96.

ELLWOOD COOPER, President,
MARK L. McDONALD,
FRED C. MILES,
R. D. STEPHENS,
FRANK A. KIMBALL,
SOL. RUNYON,
BEN M. MADDOX,
A. BLOCK,
FRANK H. BUCK,
Commissioners.

Attest:
B. M. LELONG,
Secretary, and Chief Horticultural Officer.

I.

STATE LAWS RELATING TO HORTICULTURE.

AN ACT

To Create and Establish a State Board of Horticulture.

(Approved March 13, 1883; amended by an Act approved March 8, 1889.)

The People of the State of California, represented in Senate and Assembly, do enact as follows:

Section 1. There shall be a State Board of Horticulture, consisting of nine members, who shall be appointed by the Governor; two from the State at large, and one from each of the seven horticultural districts, which are hereby constituted as follows:

First—The Sonoma District, which shall include the counties of Sonoma, Marin, Lake, Mendocino, Humboldt, Del Norte, Trinity, and Siskiyou.

Second—The Napa District, which shall include the counties of Napa, Solano, and Contra Costa.

Third—The San Francisco District, which shall include the City and County of San Francisco, and the counties of San Mateo, Alameda, Santa Clara, Santa Cruz, San Benito, and Monterey.

Fourth—The Los Angeles District, which shall include the counties of Los Angeles, Ventura, Santa Barbara, San Luis Obispo, San Bernardino, and San Diego.

Fifth—The Sacramento District, which shall include the counties of Sacramento, Yolo, Sutter, Colusa, Butte, Tehama, and Shasta.

Note.—The amendments to the original Act appear in brackets.

Sixth—The San Joaquin District, which shall include the counties of San Joaquin, Stanislaus, Merced, Fresno, Tulare, and Kern.

Seventh—The El Dorado District, which shall include the counties of El Dorado, Amador, Calaveras, Tuolumne, Mariposa, Placer, Nevada, Yuba, Sierra, Plumas, Lassen, Modoc, Alpine, Mono, and Inyo.

Sec. 2. The members appointed from each district shall be residents of the district from which they are appointed, and shall be specially qualified by practical experience and study in connection with the industries dependent upon horticulture. They shall each hold office for the term of four years, except that of the nine first appointed, four, to be determined by lot, shall retire at the end of two years, when their successors shall be appointed by the Governor.

Sec. 3. [The Board shall biennially elect a President, a Vice-President, a Chairman of the Finance Committee, and appoint from without their own number, a Secretary, who shall be ex officio Horticultural Officer, and elect of their own number a Treasurer, who shall give a bond to the State, with sureties approved by the Board, in the sum of ten thousand dollars, for the faithful discharge of his duties.]

Sec. 4. The Board may receive, manage, use, and hold donations and bequests for promoting the objects of its formation. It shall meet semi-annually, and as much oftener and at such places as it may deem expedient, to consult and adopt such measures as may best promote the horticultural industries of the State. It may, but without expense to the State, select and appoint competent and qualified persons to lecture in each of the horticultural districts named in section one of this Act, for the purpose of illustrating practical horticultural topics, and imparting instruction in the methods of culture, pruning, fertilizing, and also in the best methods of treating the diseases of fruit and fruit trees, cleansing orchards, and exterminating insect pests. The office of the Board shall be kept open to the public, subject to the rules of the Board, every day, excepting legal holidays, and shall be in charge of the Secretary during the absence of the Board.

Sec. 5. For the purpose of preventing the spread of contagious disease among fruit and fruit trees, and for the prevention, treatment, cure, and extirpation of fruit pests and the diseases of fruit and fruit trees, and for the disinfection of grafts, scions, orchard debris, empty fruit boxes and packages, and other suspected material or transportable articles, dangerous to orchards, fruit and fruit trees, said Board shall make regulations for the inspection and disinfection thereof, which said regulations shall be circulated in printed form by the Board among the fruit-growers and fruit-dealers of the State, shall be published at least twenty days in two daily newspapers of general circulation in the State not of the same city or county, and shall be posted in three conspicuous places in each county in the State, one of which shall be at the county courthouse thereof. Such regulations when so posted shall be held to impart notice of their contents to all persons within this State, and shall be binding upon all persons.

Sec. 6. [Said Board shall appoint without their number a competent person, especially qualified for the duties of his office, who shall be known as Clerk of the Publishing and Quarantine Bureau of the State Board of Horticulture (to hold office at the pleasure of the Board), who shall be qualified, by experience and education as a compiler, to correct reports and essays; to present in a logical order all the information to be published, and shall give his whole time in such work, and such other duties as may be required of him by the Board and by reason of his official position, and shall have power to enforce all rules and regulations regarding the spread of insect pests, quarantining districts or nurseries found to be infected. He shall be paid for his services as Clerk of the Publishing and Quarantine Bureau of the State Board of Horticulture, one hundred and seventy-five dollars per month, to be paid as other State officers.]

Sec. 7. [The said Board, and in case of necessity during the recess of the Board, the said Clerk of the Publishing and Quarantine Bureau, may appoint such Quarantine Guardians as may be needed to carry out the provisions of this Act, whose duties it shall be to see that the regulations of the Board, and the instructions of the Clerk of the Publishing and Quarantine Bureau are enforced and carried out; said Clerk may appoint, in case of emergency, a deputy, who shall have the same power as his own, whose salary shall not exceed three dollars per day for each day's service performed, said services to be paid by the State Board of Horticulture. The said Quarantine Guardians shall report to the said Clerk, or to the State Board, all infractions or violations of said directions, regulations, and of the law in regard to quarantine, disinfection, and destruction, of insect and other pests injurious to fruit, fruit trees, or vines, and precautions against the spreading of all the aforesaid named pests and diseases. The salary of Quarantine Guardian shall not exceed three dollars per day, and shall be paid by the owners of orchards and other places and localities under quarantine regulations; and they may maintain an action therefor before any Justice of the Peace in any township in which any quarantined locality is wholly or in part situated, but in no case shall they have any claim upon the State for such services.]

Sec. 8. [It shall be the duty of the Secretary to attend all meetings of the Board and of the Executive Committee, and to preserve records of its proceedings and correspondence; to collect books, pamphlets and periodicals, and other documents containing information relating to horticulture, and to preserve the same; to collect statistics and other information showing the actual condition and progress of horticulture, in this State and elsewhere; to correspond with agricultural and horticultural societies, colleges, and schools of agriculture and horticulture, and other persons and bodies, as he may be directed by the Board; and prepare, as required by the Board, reports for publication.

He shall appoint, subject to the approval of the Board, a competent person as Clerk, and he shall be held responsible for the acts of said Clerk. He shall be paid for his services as such Secretary and ex officio Horticultural Officer, a salary of one hundred and seventy-five dollars per month. His clerk shall be paid a salary (as such Clerk) of fifty dollars per month, each to be paid as other State officers.]

Sec. 9. (Repealed.)

Sec. 10. The Board shall, biennially, in the month of January, report to the Legislature a statement of its doings, with a copy of the Treasurer's accounts for the two years preceding the session thereof, and abstracts of the reports of the Inspector of Fruit Pests, and Secretary.

Sec. 11. The Treasurer shall receive all moneys belonging to the Board, and pay out the same only for bills approved by it, and shall annually render a detailed account to the Board.

Sec. 12. (Relates to appropriations which are provided by the Legislature every two years.)

Sec. 13. This Act shall take effect and be in force from and after its passage, and all Acts or parts of Acts inconsistent or in conflict with the provisions of this Act are hereby repealed.

Sec. 14. [The President (and in his absence the Vice-President) and the two Commissioners for the State at large, shall constitute the Executive Committee; said committee shall have charge of the management of the affairs of the Board while the Board is not in session. The members of said committee shall receive their actual traveling expenses in attending quarterly meetings of the Executive Committee. The other members of the Board shall receive their actual traveling expenses (only) in attending semi-annual meetings of the Board.]

Sec. 15. [Vacancies occurring in any office shall be filled by appointment made by the President of the Board, with the consent of the Executive Committee, until the next meeting of the Board.]

Sec. 16. [The Board shall make and publish their reports annually.]

Sec. 17. [It shall be the duty of the County Boards of Horticulture to make quarterly reports, in writing, to the State Board of the condition of fruit interests in their several districts, what is being done to eradicate insect pests, also as to disinfecting, and as to quarantine against new insects, and as to carrying out of all laws relative to the greatest good of the fruit interest. Said Board shall publish said reports in bulletin form, or may incorporate so much of the same in their annual reports as may be of general interest.]

Sec. 18. [The expenditures necessary to be made in experiments in the different districts shall be determined by the Board. On application of one or more of the fruitgrowers in such districts, the said Board shall select such person or persons to make such experiments, and pay the expenses thereof. The sum of not exceeding one thousand dollars, for traveling expenses, shall be allowed when the Board or the Executive Committee shall deem it necessary to send either the Clerk of Bureau or Secretary to direct and supervise such experiments; *provided*, that not more than one thousand dollars be expended in any one year for such traveling expenses.]

II.

LAWS RELATING TO COUNTY OR SUBORDINATE BOARDS.

AN ACT

To Protect and Promote the Horticultural Interests of the State.

(Approved March 14, 1881; amended by an Act approved March 19, 1889.)

The People of the State of California, represented in Senate and Assembly, do enact as follows:

Section 1. Section one of said Act is hereby amended so as to read as follows:

Section 1. [Whenever a petition is presented to the Board of Supervisors of any county, and signed by twenty-five or more persons who are resident freeholders and possessors of an orchard, or both, stating that certain or all orchards or nurseries, or trees of any variety, are infested with scale insects of any kind, injurious to fruit, fruit trees, and vines, codlin moth, or other insects that are destructive to trees, and praying that a Commission be appointed by them, whose duty it shall be to supervise their destruction, as herein provided, the Board of Supervisors shall, within twenty days thereafter, select three Commissioners for the county, to be known as a County Board of Horticultural Commissioners. The Board of Supervisors may fill any vacancy that may occur in said Commission by death, resignation, or otherwise, and appoint one Commissioner each year, one month, or thereabouts, previous to the expiration of the term of office of any member of said Commission. The said Commissioners shall serve for a period of

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Note.—The amendments to original Act appear in brackets.

three years from the date of their appointment, except the Commissioners first appointed, one of whom shall serve for one year, and one of whom shall serve for two years, and one of whom shall serve for three years, from the date of appointment. The Commissioners first appointed shall themselves decide, by lot or otherwise, who shall serve for one year, who shall serve two years, and who shall serve three years, and shall notify the Board of Supervisors of the result of their choice.]

Sec. 2. Section two of said Act is hereby amended so as to read as follows:

Section 2. [It shall be the duty of the County Board of Horticultural Commissioners in each county, whenever it shall deem it necessary, to cause an inspection to be made of any orchard, or nursery, or trees, or any fruit-packing house, store-room, sales-room, or any other place in their jurisdiction, and if found infested with scale bug, codlin moth, or other insect pests injurious to fruit, trees. and vines, they shall notify the owner or owners, or person or persons in charge or possession of said trees or place, as aforesaid, that the same are infested with said insects, or any of them, or their eggs or larvæ, and they shall require such person or persons to disinfect or destroy the same within a certain time, to be specified. If within such specified time such disinfection or destruction has not been accomplished, the said person or persons shall be required to make application of such treatment for the purpose of destroying them as said Commissioners may prescribe. Said notices may be served upon the person or persons owning or having charge or possession of such infested trees, or places, or articles, as aforesaid, by any Commissioner, or by any person deputed by the said Commissioners for that purpose, or they may be served in the same manner as a summons in a civil action. If the owner or owners, or person or persons in charge or possession of any orchard, or nursery, or trees, or places, or articles, infested with said insects, or any of them, or their larvæ or eggs, after having been notified as above to destroy the same, or make application of treatment as directed, shall fail, neglect, or refuse to do so, he or they shall be deemed guilty of maintaining a public nuisance, and any such orchards, nurseries, trees, or places, or articles thus infested shall be adjudged and the same is hereby declared a public nuisance, and may be proceeded against as such. If found guilty, the Court shall direct the aforesaid County Board of Horticultural Commissioners to abate the nuisance. The expenses thus incurred may be a lien upon the real property of the defendant.]

Sec. 3. Section three of said Act is amended so as to read as follows:

Section 3. [Said County Boards of Horticultural Commissioners shall have power to divide the county into districts, and to appoint a local Inspector for each of said districts. The State Board of Horticulture, or the Quarantine Officer of said Board, shall issue commissions as Quarantine Guardians to the members of said County Boards of Horticultural Commissioners, and to the local Inspectors thereof. The said Quarantine Guardians, local Inspectors, or members of said County Boards of Horticultural Commissioners, shall have full authority to enter into any orchard, nursery, or place or places where trees or plants are kept and offered for sale, or otherwise, or any house, store-room, sales-room, depot, or any other such place in their jurisdiction, to inspect the same, or any part thereof.]

Sec. 4. Section four of said Act is hereby amended so as to read as follows:

Section 4. [It shall be the duty of said County Board of Horticultural Commissioners to keep a record of their official doings, and to make a report to the State Board of Horticulture on or before the first day of October of each year, of the condition of the fruit interests in their several districts, what is being done to eradicate insect pests, also as to disinfecting and as to quarantine against insect pests and diseases, and as to carrying out all laws relative to the greatest good of the fruit interest. Said Board shall publish said reports in bulletin form, or may incorporate so much of the same in their annual reports as may be of general interest.]

Sec. 5. Section five of said Act is hereby amended so as to read as follows:

Section 5. [Each member of the County Board of Horticultural Commissioners, and each local Inspector, shall be paid for each day actually engaged in the performance of his duties under this Act, payable out of the County Treasury of his county, such compensation as shall be determined by resolution of the Board of Supervisors of the county, before entering into the discharge of his or their duties.]

Sec. 6. Section six of said Act is hereby amended so as to read as follows:

Section 6. [Said County Boards of Horticultural Commissioners shall have power to remove any local Inspector who shall fail to perform the duties of his office.]

Sec. 7. (Repealed.)

Sec. 8. Section eight of said Act is hereby amended so as to read as follows, and to be known as section seven of said Act, viz.:

Section 7. [If any member of the County Board of Horticultural Commissioners shall fail to perform the duties of his office, as required by this Act, he may be removed from office by the Board of Supervisors, and the vacancy thus formed shall be filled by appointment by the Board of Supervisors.]

Sec. 9. Section nine of said Act is hereby amended so as to read as follows, and to be known as section eight of said Act, viz.:

Section 8. [It shall be the duty of the County Board of Horticultural Commissioners to keep a record of their official doings, and to make a monthly report to the Board of Supervisors, and the Board of Supervisors may withhold warrant for salary of said members and Inspectors thereof until such time as said report is made.]

SEC. 10. A new section is hereby added to said Act, to be known as section nine, and to read as follows, viz.:

Section 9. All Acts or parts of Acts in conflict with the provisions of this Act are hereby repealed.

SEC. 11. This Act shall take effect and be in force from and after its passage.

(New section added by special Act, Statutes 1891, p. 260.)

NEW SEC. 12. When a petition is presented to the Board of Supervisors of any county, as required by section one of said Act, the said Board of Supervisors may appoint a Commission, to consist of any number less than three members, at a compensation each of not less than four dollars, and if but one member, five dollars, for each day actually engaged in the performance of his duties under this Act; and all the provisions prescribing the duties of and conferring powers upon the County Boards of Horticultural Commissioners contained in said Act shall apply to the Commission appointed under this section.

This last amendment and Act was declared unconstitutional by the Superior Court of San Bernardino, April 29, 1896, in a case which grew out of an attempt on the part of the Board of Supervisors to reduce the number of members of the Commission from three to one. The Court, in its decision, says:

THE COURT'S DECISION.

The ground of this decision is that Section 24 of Article IV of the Constitution of the State prohibits the passing of such amendatory Acts. The Constitution says: "No law shall be amended by reference to its title, but in such cases the Act revised or the section amended shall be reënacted and published at length as revised or amended." In the very title of the second Act it states that it is amendatory of the Act which provides for a three-man commission, but it does not amend it by reënacting the law.

By the Act of 1881, entitled "An Act to protect and promote the horticultural interests of the State," it became incumbent on the County Boards of Supervisors to appoint County Boards of Horticultural Commissioners to act subordinately to the State Board of Horticulture, and made it mandatory upon the Boards of Supervisors to create and appoint such a Commission. The validity of this Act having been questioned, a mandamus suit was brought against the Board of Supervisors of Sonoma County, and Hon. John G. Pressley, Judge of the Superior Court of Sonoma County, on the 19th day of June, 1889, rendered the following decision, in which the validity of the Act, directing the Boards of Supervisors to establish County Boards of Horticultural Commissioners, is sustained:

On the 19th of March an Act of the Legislature was approved, entitled "An Act to amend an Act entitled 'An Act to protect and promote horticultural interests of the State,' approved March 14, 1881."

This Act (of March, 1889) provides that, "Whenever a petition is presented to the Board of Supervisors of any county, and signed by twenty-five or more persons who are resident freeholders and possessors of an orchard, or both, stating that certain or all orchards or nurseries, or trees of any variety, are infested with scale insects * * * that are destructive to trees, and praying that a Commission be appointed by them, whose duty it shall be to supervise their destruction, as herein provided, the Board of Supervisors shall, within twenty days thereafter, select three Commissioners for the county, to be known as a County Board of Horticultural Commissioners."

The duties of the Board so appointed are declared by the Act. It appears from the complaint that, in accordance with this Act, a petition was presented to and filed with the Board of Supervisors, signed by this plaintiff and twenty-six other persons possessing the qualifications prescribed by the Act, praying for the appointment of a County Board of Horticultural Commissioners for Sonoma County, and a demand was made on the Supervisors that they carry into effect the provisions of the Act, and appoint the Commissioners.

The Board refused to appoint Commissioners.

Twenty days have expired since the filing of the petition and the demand for action upon it, and still the Board of Supervisors refuse and neglect to make any selections or appointment of Commissioners.

This action is brought for a writ of mandate compelling the Board of Supervisors to make the selection and appointment as required of them by the Act.

A demurrer has been interposed to the complaint, and in support thereof, it is contended:

First—That the Act of 14th of March, 1881, of which the Act of 19th of March is amendatory, was repealed by an Act approved 13th of March, 1883, which provides for the appointment by the Governor of a State Board of Horticulture, and that in consequence of the Act of 1889 being an amendment of a repealed statute, it is nugatory.

The Act of 1883 does not, in express terms, repeal the Act of 1881, nor is that Act elsewhere expressly repealed. It is a well-settled legal principle that repeals by implication are not favored. A subsequent Act does not, by implication, repeal a prior statute unless the subsequent one entirely covers the provisions of the first, and so completely that every portion of the first is provided for by the second. There must appear an intent to entirely substitute one for the other.

Says Bishop in his work on Statutory Crimes, Section 154: "We have seen that every legislative Act in affirmative words is to be regarded, *prima facie*, as an addition to the mass of law; for such on its face it purports to be. Yet when it is inconsistent with the former law, it must, as the last expression of the legislative will, prevail. But repeals by implication, thus explained, are not favored. And a legislative intent to repeal an existing statute is never presumed. If two Acts, seeming to be repugnant, can be reconciled by any fair construction, they must be, when no repeal will be held to take place."

The same principle is laid down by Judge Field in the case of *Pierrepont* vs. *Crouch*, 10 Cal. 316.

There are numerous other authorities to the same effect.

Is there any apparent intent to substitute one of these Acts for the other, or such repugnance as would destroy the first? Let us see. The first provides for a County Board of Horticulture. The second for a State Board. The first prescribes duties to be performed by County Boards of Supervisors. The second prescribes duties to be discharged by the Governor. The first provides for a Board of three Commissioners with local jurisdiction. The second for a Board of nine Commissioners with a jurisdiction coëxtensive with the State. The first authorizes Boards created by its authority to divide counties into districts. The second creates districts composed of several counties. The first requires duties to be performed by County Boards which are not required by the second, of the State Board. For instance: The first provides for proceedings against persons who, after notice, fail or refuse to treat infested trees as directed by the Board, and a destruction of trees by such Board when directed by a court. No such proceedings and destruction are provided for by the second. There are other differences between the two Acts which might be pointed out, but these are sufficient to show that there is no such similarity in the powers of the Boards created by them as would necessarily cause a conflict between these Boards, or would justify a court in holding that one Act repeals the other. I must, therefore, hold, that the Act of 1881 was not repealed by the Act of 1883, and was in full force when the amendatory Act of 1889 was passed. The Act of 1883 is an addition to the then existing legislation, and not a substitute for the Act of 1881.

Second—It was contended that Acts of the Legislature which provided that a duty imposed shall be performed within a certain time are directory and not mandatory. I cannot assent to that proposition. Where a Court or Board is directed by law to perform an act in a given time, the law, unless it declares the act may not be done after the expiration of the time, is so far directory as that the act is valid though done after the time fixed, but is not directory in the sense that the duty or act directed may be entirely disregarded or omitted. The time is given that the Board may have ample opportunity to act intelligently and with good judgment, but not to enable the Board or officer of whom the duty is required to disregard it entirely. I have no doubt but that the Board of Supervisors is required by the law in question to appoint a County Board of Horticultural Commissioners, and that it may be lawfully done after the expiration of the twenty days given them in the Act for deliberation.

Counsel referred to some authorities from other States in support of his contention. I do not think these authorities go to the extent claimed by him, and if they did, there being no such decision by our own Supreme Court, I would hold the law in this State to be different. The purpose of the Legislature was to give the Supervisors time to make judicious selections, and not to justify or authorize an annulment of the legislative will expressed by the statute.

III.

HORTICULTURAL QUARANTINE REGULATIONS.

At a meeting of the State Board of Horticulture, held in San Francisco, August 15, 1894, the following regulations were adopted, in accordance with Section 5 of the Act of 1883, creating a State Board of Horticulture, and are therefore binding upon all persons:

REGULATIONS

AMENDING ALL EXISTING REGULATIONS HITHERTO PASSED, AND TO TAKE EFFECT AND BE IN FORCE FROM AND AFTER AUGUST 15, 1894.

RULE I. All consignees, agents, or other person or persons, *shall*, within twenty-four (24) hours, notify the Quarantine Officer of the State Board of Horticulture, or a duly commissioned Quarantine Guardian, of the arrival of any trees, plants, buds, or cions at any point of debarkation in the State of California.

RULE II. All trees, plants, cuttings, grafts, buds, or cions, imported or brought into the State from any foreign country, or from any of the United States or Territories, are hereby required to be disinfected, as hereinafter provided, upon arrival at any point where they are to be unloaded; and, furthermore, if any of said trees, plants, cuttings, grafts, buds, or cions are found infested with insects, or with any fungi, blight, or other disease injurious to fruit or to fruit trees, or to other trees or plants, they *shall* remain in quarantine fourteen (14) days, or until the Quarantine Officer of the State Board of Horticulture, or a duly commissioned Quarantine Guardian, can determine whether the said trees, plants, cuttings, grafts, buds, or cions are free from live injurious insect pests, or their eggs, larvæ, or pupæ, *before* they can be offered for sale, gift, distribution, or transportation.

RULE III. All trees, plants, cuttings, grafts, buds, or cions, infested with any insects, fungi, blight, or other diseases known to be injurious to fruit or to fruit trees, or to other trees or plants, and liable to spread contagion, *are* hereby required to be disinfected before being offered for sale, gift, removal, distribution, or transportation.

RULE IV. All peach, nectarine, apricot, plum, or almond trees, and all other trees budded or grafted upon peach stocks or roots, all peach or other pits, and all peach, nectarine, apricot, plum, or almond cuttings, buds, or cions, raised or grown in a district where the "peach yellows" or the "peach rosette" are known to exist, are hereby prohibited from being planted or offered for sale, gift, or distribution within the State of California.

RULE V. All trees, plants, cuttings, grafts, buds, cions, seeds, or pits arriving from any foreign country, found infested with insect pests or their eggs, larvæ, or pupæ, or with fungi, or other disease or diseases hitherto unknown in this State, *are* hereby prohibited from landing.

RULE VI. Fruit of any kind grown in any foreign country, or in any of the United States or Territories, found infested with any insect or insects, or with any fungi, blight, or other disease or diseases, injurious to fruit or to fruit trees, or to other trees or plants, *is* hereby prohibited from being offered for sale, gift, or distribution within the State.

RULE VII. Transportable material of any kind, infested by any insect or insects, or their eggs, larvæ, or pupæ, or by any fungi, blight, or other disease or diseases known to be injurious to fruit or to fruit trees, or to other trees or plants, and liable to spread contagion, *is* hereby prohibited from being offered for sale, gift, distribution, or transportation, until said material has been disinfected by dipping it in boiling water and allowing it to remain in said boiling water not less than two minutes; such boiling water, used as such disinfectant, to contain in solution one pound of concentrated potash to each and every ten gallons of water.

RULE VIII. All trees, plants, cuttings, grafts, buds, or cions may be disinfected by dipping in a solution of three fourths of a pound of whale-oil soap (80 per cent) to each and every gallon of water; said whale-oil soap solution *shall* be kept at a temperature of 100° to 115°. Said trees, plants, cuttings, grafts, buds, or cions shall remain in said solution not less than two minutes. After said trees, plants, cuttings, grafts, buds, or cions have been disinfected they *shall* remain in quarantine fourteen (14) days for subsequent inspection, and if deemed necessary by the Quarantine Officer of the State Board of Horticulture, or a duly commissioned Quarantine Guardian, for further disinfection.

RULE IX. All trees, plants, cuttings, grafts, buds, or cions may be disinfected by fumigation with hydrocyanic acid gas, as follows: Said trees, plants, cuttings, grafts, buds, or cions *shall* be covered with an air-tight tent or box, and for each and every one hundred cubic feet of space therein, two thirds of an ounce of C. P. cyanide of potassium (98 per cent), one fluid ounce of sulphuric acid, and two fluid ounces of water shall be used. The cyanide of potassium shall be placed in an earthenware vessel, the water poured over the said cyanide of potassium, afterwards adding the sulphuric acid, and the tent or box to be immediately closed tightly, and allowed to remain closed for not less than forty minutes. After said trees, plants, cuttings, grafts, buds, or cions have been treated with hydrocyanic acid gas, as above directed, they *shall* remain in quarantine for fourteen (14) days for subsequent inspection, and if deemed necessary by a member of the State Board of Horticulture, or the Quarantine Officer of said Board, or a duly commissioned Quarantine Guardian, for subsequent disinfection.

Rule X. All trees, plants, cuttings, grafts, buds, or cions imported or brought into this State *shall* be inspected upon arrival at first point of debarkation, and if found infested with mining scales (*Chionaspis biclavis*) or other injurious insects which cannot be destroyed by the remedies required in Rules VIII and IX of these regulations, *are* hereby prohibited from being planted or offered for sale, gift, or distribution, and shall be proceeded against as a nuisance.

Rule XI. Any person or persons having in their possession trees, plants, cuttings, grafts, buds, cions, seeds, or pits, infested with any insect or insects, or with any fungi, blight, or other disease or diseases, injurious to fruit or to fruit trees, or to other trees or plants, and who refuse or neglect to disinfect the said trees, plants, cuttings, grafts, buds, cions, seeds, or pits, as is required by Rules VIII and IX of these regulations, after having been notified to do so by a member of the State Board of Horticulture, the Quarantine Officer of said Board, or a duly commissioned Quarantine Guardian, the said trees, plants, cuttings, grafts, buds, cions, seeds, or pits shall be declared a public nuisance, and shall be proceeded against as provided for by law.

Rule XII. Animals known as flying-fox, Australian or English wild rabbit, or other animals or birds detrimental to fruit or fruit trees, plants, etc., *are prohibited* from being brought or landed in this State, and if landed they *shall* be destroyed.

IV.

ENFORCEMENT OF THE HORTICULTURAL QUARANTINE REGULATIONS.

In a case brought before the Superior Court of Los Angeles, the constitutionality of the Act of 1881, as amended, was questioned as to its enforcement, and upheld. It was an action brought to declare a shipment of orange trees from Tahiti a nuisance and have them destroyed, they being infested with injurious insects, etc. The findings of the Court are as follows:

THE OPINION.

This is an action brought by the District Attorney of the County of Los Angeles, in the name of the people, for the condemnation and abatement as a nuisance of certain trees. The complaint alleges that in June, 1891, the defendants brought from Tahiti to San Pedro, in the County of Los Angeles, certain orange trees, numbering about 325,000, and that the same were, and still are, infested with scale insects and other pests injurious to fruit trees. That the Horticultural Commissioners of the County of Los Angeles notified defendants that the trees were so infested, and required them to eradicate and destroy the insect pests thereon. That defendants caused the process of disinfection to be performed upon said trees, but said process was unsuccessful, and, although frequently repeated, has not eradicated or destroyed said insects. That among said insects is a scale insect hitherto unknown in the State of California, which cannot be destroyed by any process of disinfection; and that the said scale insects with which the trees are infested, if not destroyed, will be introduced into the orange orchards of California, and the orange industry greatly injured, if not totally destroyed. That the said scale insects cannot be destroyed without the destruction of said trees; that the defendants are contemplating the removal of said trees into the interior of the State of California, and that the said scale insects would be thereby distributed among other trees and propagated and spread all over the State of California. The complaint prays a judgment of the Court that the trees be declared a nuisance and ordered to be destroyed.

Plaintiff relies, for its right to maintain the action, upon the provisions of the Act of the Legislature, approved March 19, 1891, declaring any orchards, trees, plants, or shrubs infested with insect pests injurious to plants, trees, etc., to be a nuisance, and also upon the theory that the trees in question are, under the general provisions of the Code, a public nuisance, and may be abated by an action brought in this manner.

It therefore becomes necessary for the Court to consider the power of the Legislature to adopt this statute, and the question whether, in the absence of statutory provisions, the action could be maintained.

My attention has not been directed to any constitutional limitation which affects the right of the Legislature to adopt a statute such as the one in question. The statute does not determine that any specific orchard or trees are a nuisance, but leaves it to the courts to determine whether there exists a condition of affairs which will make any particular trees a nuisance, and is, in my opinion, constitutional.

The law of nuisance, under our codes, is practically but a reënactment of the common law; and while this case is peculiar in its character and circumstances (being the first of the kind tried in the State), and in many respects utterly unlike any case to be found in the reports, yet the duty to be performed by the Court is the application of decisions disposing of cases widely differing from this as to the facts, but laying down principles which, by analogy, can be applied to the facts of this case.

It is peculiarly the characteristic of cases, under the law of nuisance, that they are largely dependent upon surroundings. The common law is not an iron-cast system, to which every case must be fitted without regard to its particular circumstances, but is a system which derives its beauty and utility from the fact that it is the condensation of the wisdom and learning of centuries, modified from time to time by the circumstances of period and place. In the consideration of any case which is dependent, to a greater or less degree, upon the circumstances and surroundings of the community and State, it is the duty of the Court to take into consideration the condition and development of the industries which may be affected by its judgment, for the purpose of properly applying the rules of law to the circumstances of the case. The Court, therefore, in applying the principles of the common law and the decisions thereunder, takes into consideration all the facts to which those decisions and principles are to be applied.

"That new conditions and new facts may produce the novel application of a rule which has not been before applied in like manner, does not make it any less the common law; for the latter is a system of grand principles, founded upon the mature and perfected reason of centuries. It would have but little claim to the admiration to which it is entitled if it failed to adapt itself to any condition, however new, which may arise; and it would be singularly lame if it is impotent to determine the right of any dispute whatever. Having, as far as we have gone, met all difficulties by adhering to its doctrines, we have no ground to presume that we will have to go beyond its precincts for a solution of any which may arise. Every Judge is bound to know the history and the leading traits which enter into the history of the country where he presides. This we have held before, and it is also an admitted doctrine of the common law." (*Conger* vs. *Weaver*, 6 Cal. 548.)

The Court, therefore, takes judicial notice of the history, development, and character of the industries of California; of the fact that the production of fruits is one of the leading occupations in this State, and that a large portion of the people are dependent upon it. It takes judicial notice of the fact that a large portion of the land in this and adjoining counties is devoted to the cultivation of citrus fruits, and that the annual production and shipment of oranges is very great, and that the spread of any insect pest injurious to citrus trees must necessarily result in serious injury to that business, and in great loss and destruction of property.

That orchards and trees infested by scale or insect pests injurious to vegetation, and which will easily spread to other places, must be a nuisance, *prima facie*, seems too clear to require discussion, and would not receive it at the hands of this Court but for the fact that this is the first case of this kind.

"A nuisance is anything that worketh hurt, inconvenience, or damage." (Black, vol. 3, p. 213.)

"Anything which is injurious to health, or is indecent or offensive to the senses, or an obstruction to the free use of property, so as to interfere with the comfortable enjoyment of life or property, or unlawfully obstructs the free passage or use, in the customary manner, of any navigable lake, or river, bay, stream, canal, or basin, or any public park, square, street, or highway, is a nuisance." (Sec. 3479, C. C.)

"A public nuisance is one which affects at the same time an entire community or neighborhood, or any considerable number of persons, although the extent of the annoyance or damage inflicted upon individuals may be unequal." (Sec. 3480, C.C.)

The kinds of nuisances which have been abated are almost innumerable in variety, each dependent upon the particular character and circumstances under which it exists.

In the case of *Campbell* vs. *Seaman*, 63 N. Y. 568, the use of bituminous coal, which produced vapors injurious to vegetation, was held to be a nuisance. Again, a house in so ruinous a condition as to be likely to fall upon the house of another, is a nuisance. (*Tenant* vs. *Goldwin*, 2 Ld. Raymond, 1893.) Buildings in an unsafe condition in a public street are common nuisances. (Wood's Law of Nuisances, p. 8.) Production of vapors injurious to vegetation is a nuisance. (Wood's Law of Nuisances, Sec. 536, *et seq.*)

It has been argued by defendant's counsel that a prospective nuisance will not be abated, and the authorities cited by them would be conclusive in this case if applicable to its facts. But the fallacy of their argument is that in the cases cited by them no considerable injury could be done until the actual existence of a nuisance could be shown. In the case at bar, before damage could be actually shown, it would be necessary for the scale insects in question to be disseminated through a considerable portion of the orchards of the State and their propagation have reached a stage at which it would be extremely difficult, if not impossible, to check and eradicate them.

It appears to me that this case belongs to that class in which, if the allegations of the complaint are true, a damage will be inferred, and it is not necessary to wait until it is actually done. It is similar in that respect to the cases in which diseased animals are taken to public places when there is danger of infection, to the cases of the storing of explosives, and to the cases of condemnation of dangerous buildings, and places likely to be injurious to the health of the community—in all of which the abatement of the nuisance rests merely upon the reasonable apprehension of danger. The fact that the trees are at San Pedro does not prevent their being considered an existing nuisance, as the evidence shows that the larvæ of the scale may be carried by birds, insects, and the winds to distant portions of the county and State.

The evidence in the case shows that at the time of the arrival of the trees at San Pedro they were infested with eight different varieties of pests, and that subsequently they were treated six times with different processes for the destruction of the scale; that the treatment was successful as to all kinds except a species of scale hitherto unknown in California, called the mining scale or *Chionaspis biclavis*; and that all efforts to eradicate this scale have been unsuccessful, and seem to have been abandoned by defendants.

The evidence with regard to this scale is entirely that of expert witnesses, who, never having seen it before, are unable to testify positively as to its effects, other than from their opinion derived from familiarity with the cultivation of the orange, from experience with the other scale insects similar in character with which orange trees are infested, and from their observation of this insect found upon the trees in question. The evidence, and the inspection of the Court, however, show positively that the mining scale derives its nutrition and support entirely from the tree, and consequently must be injurious in a greater or less degree. The expert witnesses all agree in the opinion that it is injurious to the health of the tree, and that if introduced into the State it would occasion great injury to the orange orchards.

An entomologist and agent of the Department of Agriculture testified that he had made an examination of the trees at San Pedro, and found the mining scale upon them in a healthy condition on the day before the trial of the cause; that he did not know of its existence elsewhere in the State, and that there could be no doubt about its being detrimental, living at the expense of the tree. He was of the opinion that by some process the scale might be destroyed without the destruction of the trees, but was unable to give any method by which it could be done.

Alexander Craw, Quarantine Officer of the State Board of Horticulture, testified that he had inspected the trees eight or ten times, examined the scale in question, and found the live scale and larvæ. In his opinion the mining scale could not be destroyed without destroying the trees. He considered it a very destructive scale, and knew of no way by which it could be eradicated except by destroying the trees. It was, in his opinion, a more dangerous insect than the cottony-cushion scale, and would be very injurious to the orange industry.

The other witnesses testified substantially to the same opinions as those given by Mr. Craw.

The trees in question, now reduced in number to about 60,000, are contained in crates at San Pedro; and the evidence shows that, in an examination of the trees at this time, live scale is found on only a portion of the trees, but that a thorough examination would require five or ten minutes for each tree.

The evidence establishes all the allegations of the complaint, being open only to the objection that it is to a great extent merely expert opinion. But, under the circumstances, that is the best evidence of which the case is susceptible.

This evidence is practically uncontradicted by the defense, as no witness has been produced who claims to know any process by which this scale can be destroyed, or that it is not injurious.

The defense claims that the trees should be separated, and only those upon which the scale are found be destroyed. There is no doubt that the position of the defendants is correct, that in abating a nuisance no more property should be destroyed than is absolutely necessary for that purpose. But in this case the situation of these trees is such that there is no certainty that all are not infested, and if such separation can be made it should be done by defendants.

The period during which the case has been pending was sufficient to give the defense every opportunity to disinfect these trees.

From the evidence of the experts, and in the absence of any suggestion of a method by which the trees can be disinfected, the Court must conclude that it cannot be done without the destruction of the trees.

It therefore follows that the allegations of the complaint are sustained by the evidence. The Court is of the opinion that the statute of March 19, 1891, is constitutional, and that even in the absence of such a statute the trees in question are a nuisance under the Code, and that plaintiff is entitled to the relief demanded in the complaint.

Let findings and judgment be submitted in accordance with this opinion.

J. W. McKINLEY,
Judge.

V.

TRANSACTIONS OF THE STATE BOARD OF HORTICULTURE.

April 16, 1895.

The State Board of Horticulture met at 10 o'clock A. M., in pursuance to call issued by President Ellwood Cooper.

The following Commissioners were present: Messrs. Ellwood Cooper, L. W. Buck, Frank A. Kimball, Mark L. McDonald, Fred C. Miles, and J. L. Mosher. Absent: Messrs. A. Block, Sol. Runyon, and I. H. Thomas.

The minutes of November 21 and 22, 1894, were read and approved. President Cooper in a few chosen words, welcomed Col. Mark L. McDonald, the newly appointed Commissioner for the Sonoma District, into the Board.

Report of Treasurer.—The report of the Treasurer was read and ordered placed on file, as follows:

To the honorable the State Board of Horticulture:

Gentlemen: As your Treasurer, I beg to herewith present, for your consideration, my report since your last meeting. The following are the amounts paid to cover claims approved by your Executive Committee and allowed by the State Board of Examiners:

Nov. 19, 1894	$429 58
Nov. 29, 1894	1,402 86
Dec. 18, 1894	496 62
Jan. 2, 1895	455 30
Jan. 22, 1895	292 85
Feb. 2, 1895	333 30
Feb. 28, 1895	756 42
Total	$4,166 93
Amount expended as per last report	2,546 06
Amount expended to date	$6,712 99
Appropriation	10,000 00
Balance unexpended	$3,287 01

Respectfully submitted.

FRED C. MILES,
Treasurer.

Referred to Executive Committee.

Report of Secretary.—The report of the Secretary was read and referred to the Executive Committee, with full power to act.

Report of Quarantine Officer.—The report of the Quarantine Officer was read and ordered placed on file.

Commissioner Kimball moved that Mr. Buck be appointed a committee of one to interview the Governor, and request him to be present some time to-day. Carried.

On motion, a recess was taken until 3 o'clock P. M.

Afternoon Session.

There were present Messrs. Cooper, Buck, Kimball, Mosher, McDonald, Miles, and Thomas.

Commissioner Buck, on the committee to interview the Governor, reported that he was unable to see him, but had telegraphed to his

Secretary and expected an answer very soon; therefore, he moved that a recess be taken to Wednesday, April 17, 1895, at 10 o'clock A. M. Carried.

WEDNESDAY, April 17, 1895.

The Board met at 10 o'clock A. M. The following Commissioners were present: Messrs. Cooper, Buck, Kimball, McDonald, Miles, Mosher, and Thomas. Absent: Commissioners Block and Runyon.

Commissioner Buck reported that, on account of the Governor's illness, he had not been able to hear from him.

ELECTION OF OFFICERS.

The President read Section 3, Statutes of 1889, p. 89, relating to the election of officers, and declared the order of business to be the election of officers, in accordance with the law.

President.—Commissioner McDonald introduced the following resolution:

> WHEREAS, Pursuant to Section 3, Statutes of 1889, p. 89, it becomes the duty of this Board to biennially elect a President thereof; and whereas, the term of office of the President of this Board has expired and a vacancy exists therein, two years having elapsed since his election; now, therefore, be it
>
> *Resolved*, That we proceed to the election of a President of this Board, to hold office for the term of two years from the date thereof.

Adopted.

Commissioner Buck nominated Commissioner Cooper for the position of President, and, on motion, the Secretary was instructed to cast the vote of the Commissioners present for Ellwood Cooper for the position of President for two years; whereupon, he was declared elected by Vice-President Buck.

President Cooper spoke feelingly, and said he felt complimented, and thanked the Board for the confidence placed in him. He said he had worked for the fruit interests of the State, at a considerable outlay, for which he received no compensation from the State. He said he had lost over $100,000 on his ranch in twenty-four years by the depredations of insect pests, and that fact alone was sufficient impulse to compel any man to fight insect pests. He further stated that he felt keenly the position in which the Board had been placed, and that while he had expected to be relieved from the great task and hard work, he had concluded to remain in the Board.

Vice-President.—Commissioner Mosher nominated Commissioner Buck for the position of Vice-President, and, on motion, the Secretary was instructed to cast the vote of the Commissioners present for L. W. Buck for Vice-President; whereupon, he was declared elected by President Cooper.

Vice-President Buck thanked the Board warmly, and said he felt highly complimented and that what he had done in the past was for the interest of the State and his friends.

VOTE OF THANKS.

President Cooper spoke of the importance of the work of Vice-President Buck, and recommended that a vote of thanks be tendered him as a mark of appreciation of a duty well performed.

Commissioner Kimball said he wished to accentuate all the President had said, and paid Vice-President Buck a high compliment. He then moved that a vote of thanks be tendered to Vice-President Buck, and that the same be spread upon the minutes of the Board, for his untiring work in behalf of the horticultural interests of the State and the Board.

Adopted unanimously by a rising vote.

Vice-President Buck replied that he had worked quite hard, but that he had done what he had, prompted by the good will of his associates.

Auditor.—Commissioner Mosher was unanimously elected Auditor, or Chairman of the Finance Committee.

Treasurer.—Commissioner Fred C. Miles was unanimously elected Treasurer.

Secretary.—B. M. Lelong was unanimously elected Secretary for the term of two years.

Quarantine Officer.—Alexander Craw was duly elected Quarantine Officer.

Clerk.—The Secretary, B. M. Lelong, announced to the Board the appointment of Miss Ella F. Hallahan as his Clerk, and asked the Board to confirm his appointment, which was done.

A recess was taken to meet in the afternoon at 2:30 o'clock.

AFTERNOON SESSION.

The Board met in the afternoon at 2:30 o'clock. All the Commissioners present at the morning session were present. The following resolution was adopted:

Resolved, That all matters pertaining to rental or removal of offices of the Board be referred to the Executive Committee, and full power is hereby given said committee to transact any and all business on behalf of said Board, until the next meeting of the Board, in November, 1895.

The minutes of the morning session were then ordered read. Commissioner McDonald moved that the same be approved. Motion carried.

Commissioner Buck moved that the Board adjourn to meet at the call of the President. Carried.

JUNE 6, 1895.

The meeting was called to order by President Cooper, but there being no quorum, an adjournment was taken to meet June 7, at 9:30 A. M.

JUNE 7, 1895.

The meeting was called to order by President Cooper, and the following Commissioners answered to their names: Cooper, Kimball, Mosher, McDonald, and Thomas. Absent: Runyon, Miles, and Block.

Letters were read from Commissioners Miles and Block, explaining their absence, which were ordered placed on file.

President Cooper announced the death of Commissioner Buck, the Vice-President of the Board.

Commissioner Kimball offered the following resolution:

IN MEMORIAM.

WHEREAS, It has pleased the All Wise Creator to remove, by death, L. W. Buck, the Vice-President of this Board; therefore, be it

Resolved, That in the death of ex-Senator Buck the horticulturists of the State have lost a steadfast friend, and the State a faithful servant; and, not only do these facts apply to the State, but the United States has lost one of its most energetic and progressive citizens;

Resolved, That the State Board of Horticulture, assembled this 7th day of June, 1895, at the rooms of the Board in San Francisco, hereby extend to the family of the late Commissioner our heartfelt sympathy in this, their greatest possible bereavement;

Resolved, That these resolutions be spread upon the records of the Board, and that a copy be engrossed and attested by its officers, and transmitted to the family of our late associate Commissioner.

Adopted unanimously by a rising vote.

The Executive Committee reported that they had examined the books and accounts, and had taken an inventory of the property in charge of the Board. The reports are as follows:

To the honorable the State Board of Horticulture:

GENTLEMEN: Your Executive Committee begs to report that they have examined the books and accounts, and find the same correct.

The following is a statement of expenses of the State Board of Horticulture for the year ending June 30, 1894:

Stenographer	$306 25
Traveling expenses of Commissioners	626 85
Office furniture	91 90
Papers	31 10
Library	86 50
Janitor	236 60
Postage	395 75
Cartage	61 05
Freight	18 18
Woodcuts and electrotypes	436 74
Lithographs	150 00
Miscellaneous printing	169 90
Salary of Special Agents	894 50
Traveling expenses of Special Agents	91 25
Traveling expenses of Quarantine Officer	375 10
Traveling expenses of Deputy Quarantine Officer	20 40
Traveling expenses of Secretary	200 45
Sketches and drawings	561 82
Office supplies	156 72
Rent	1,645 00
Salary of Deputy Quarantine Officer	69 00
Repairing	23 40
Expressage	117 40
Experimenting	576 72
Midwinter Fair	2,077 11
Sundries	193 40
Seventeenth Fruit-Growers' Convention	183 35
Telegrams and telephone	203 55
Total	$9,999 99

Expenses of the State Board of Horticulture for the forty-sixth fiscal year, up to April 30, 1895:

Papers	$60 90
Office furniture	38 85
Library	15 00
Janitor	185 00
Traveling expenses of Commissioners	669 75
Cartage	135 93
Freight	211 79
Woodcuts and electrotypes	173 21
Miscellaneous printing	188 25
Salary of Special Agents	811 25
Traveling expenses of Quarantine Officer	310 20
Traveling expenses of Secretary	278 80
Sketches and drawings	226 08
Rent	1,350 00
Salary of Deputy Quarantine Officer	232 15
Repairing	279 13
Experimenting	1,258 25
Telegrams and telephone	151 70
Eighteenth Fruit-Growers' Convention	215 00
Sundries	280 74
Office supplies	88 17
Pure food exhibit	197 95
Postage	1,677 65
Expressage	37 95
	$9,073 70
Appropriation	10,000 00
Balance	$926 30

Bills in the office which have not been presented to State Board of Examiners:

Rent	$135 00
J. Caire	1 00
Press Clipping Bureau	8 40
Oscar Foss	8 80
A. Roman	14 00
Cox Seed Co.	75
S. P. Taylor Co.	10 50
H. S. Crocker Co.	21 40
J. Isaac	165 35
B. M. Lelong	58 80
City Transit Co.	23 26
	$447 26

Estimated expenses for remainder of year:

Rent (June)	$135 00
Alex. Craw, traveling expenses	85 00
Expressage, telegrams, etc.	10 00
Salary of Janitor (June)	20 00
Salary of Deputy Quarantine Officer (June)	80 00
Traveling expenses of Secretary	20 00
Traveling expenses of Commissioners (Executive Committee)	155 00
Experimenting	100 00
	$605 00
Bills, as above	447 26
	$1,052 26
Balance to credit of Board	926 30
Deficit	$125 96

All of which is respectfully submitted.

J. L. MOSHER,
FRANK A. KIMBALL,
ELLWOOD COOPER,
Executive Committee

Inventory of State Property, in Charge of State Board of Horticulture.

To the honorable the State Board of Horticulture:

Gentlemen: We, your Executive Committee, beg leave to submit to you the following supplementary report, showing the amount of property of the State in our charge:

1 walnut Derby desk.
1 walnut secretary.
1 double-top desk.
1 large, 6-foot, standing desk.
1 walnut stool for standing desk.
1 small oak desk.
1 president's desk.
1 small walnut desk.
2 large reading tables.
2 medium reading tables.
1 large walnut bookcase.
4 small tables.
1 leather lounge.
2 typewriters (1 worn out).
4 wall book-shelves.
3 gas-stoves.
1 gas-heater.
1 umbrella stand.
2 stepladders (1 for library).
1 walnut cabinet for specimens.
1 walnut copying-press stand.
4 letter-holder cases.
1 corporate seal.
2 copying-presses.
1 typewriter stand.
6 inkstands.
3 State maps.
1 United States map.
4 bookracks.
98 paper boxes (files).
4 18-foot operating tables.
1 drawing table on horses.
1 perforator and eyeleteer.
1 stove (large).
3 call bells.
4 locks.
1 600-page day book (covered with duck).
1 600-page ledger (covered with duck).
1 600-page cash book.
1 300-page record book.
1 200-page record book (Executive Com.).
1 pigeon-hole case, 6x10 feet.
1 pigeon-hole case, 3x5 feet.
6½ dozen pigeon-holes.
1 library inkstand.
54 specimen-cases with glass fronts.
5 rotary desk chairs.
15 frames for dry photo plates.
500 wooden boxes (for mailing parasites).
1 carpet-sweeper.
1½ dozen newspaper files.
1 duster and pan.
1 post office iron box.
1 post office wooden box for papers.
3 waste-baskets.
2 chair cushions.
1 blackboard.
1 street sign.
1 large sign in front, 16-foot.
1 large flag, 5x16 feet.
2 small flags, 3x5 feet.
2 pair portieres.
1 merchandise truck.
1 marking-pot and brush.
1 arm rest.
1 index clock.
2 zinc signs.
1 open front p. heater.
1 hatchet.
1 hammer.
1 mallet.
1 saw.
1 chisel.
1 safe, 5 feet high.
9 cuspidores.
4½ dozen folding chairs.
22 large office chairs.
31 small office chairs.
1 window duster.
1 can gasoline (for preserving fruit).
10 large bowls.
3 porcelain buckets.
4 glass dishes.
3 agate measures.
6 agate ladles.
3 agate pans.
19 stone jars, 3 gallons.
4 pitchers.
160 glass bottles, various sizes.
½ dozen test-tubes.
1 test-tube rack.
1 Tisdall globe.
50 feet tubing.
2 12x16 H. P. trays.
1 Blair lantern.
1 Ziens dissecting microscope.
1 proportion divider.
1 spirit gauge.
2 forceps.
2 watchmakers' glasses.
1 pocket lens.
1 common lamp.
1 Acme micro camera lamp.
1 3-inch bullseye lamp.
1 Abbe S. S. condenser.
3 boxes microscope slides.
1 large Bausch & Lomb microscope stand, with accessory and extra pinscope eye-piece.
1 small Bausch & Lomb microscope with eye-piece.
1 wooden triangle.
1 square.
1 glass tube.
1 Steenhiel apl. lens and holder.
3 low shutters.
1 $\frac{8}{10}$ Perriscope lens.
1 ⅝ Perriscope lens.
1 Blair front board.
1 Eastman roll holder, fitted.
6 ⅝ plate-holders.
1 pocket compass and case.
4 dozen microscope slides.
1 Bausch & Lomb photo-micro camera, with extension bellows.
1 microscope stand (table).
2 P. O. balances.
1 pair 11-inch shears.
4 thermometers.
1 water filter.
2 screwdrivers.
1 lye hydrometer.
1 sugar hydrometer.
1 handmill for grinding bones.
1 6-inch extension for camera.
1 flange 5-inch lens.
1 kodak camera.
1 $\frac{1}{12}$ Jiess objective.
1 objective No. 624.
1 objective No. 623.

1 objective No. 602.
1 objective No. 601.
1 camera lucida.
½ gross slides.
1 stage forcep.
1 Eastman 5x8 camera.
24 Eastman plate-holders.
1 Beck wide angle lens—5x8.
1 Beck long view lens—5x8.
2 tripods No. 2.
2 focus cloths.
1 Packard shutter.
4 developing trays.
1 Tisdal lamp.
2 8-dr. graduates.
1 large hand magnifying glass.
1 small hand magnifying glass.
1 large reading glass.
1 club microscope stand.
1 H barometer.
1 testing glass tube.
1 1-gal. measure.
1 ½-gal. measure.
5 gals. alcohol.
16 feet rubber tubing.
1 tree cover—24x24 feet.
1 pair must scales.
1 broom.
1 envelope sealer.
1 Waterman pen (for officers when in field to fill out quarantine notices).
50 photo micrographs.
2 large glass propagating-houses for propagating parasites—20x14 feet.
1 gas generator.
1 rubber generator joint.
1 spray attachment.
1 fumigator.
1 cover for treating trees, made of B. S. drill.
1 hood made on 34 iron wire cloth, and crate.
1 generating apparatus, with pipes.
1 press (large).
1 press (laboratory).
15 upright tanks (large).
4 large square tanks.
1 furnace.
2 buckets.
100 feet hose.
1 washer with separator and table.
12 trays.
6 sorters.
2 pair pruning-shears.
3 work tables.
3 exhibit tables.
30 feet shelving and stand for holding exhibits of fruit in jars.
24 rubber stamps.
60 linear feet partitions, with glass above.
324 square feet book shelving.
1 dark room 6x10.
1 zinc sink.
2,000 negatives of fruits, etc. (estimated).
1,000 photo plates of fruits, etc. (estimated).
450 water-color drawings.
6 desk pads.
7 large frames.
48 small frames, water-color pictures.
24 window shades.
5 pounds salicylic acid.
5 pounds bisulphite soda.
5 pounds boracic acid.
5 pounds zinc chloride.
5 pounds arsenic.
5 pounds saltpetre.
2 packages sal ammonia.
10 pounds glycerine.
20 pounds potash.
1 pound kylene.
1 pound carb. acid mal. G. L.
2 pounds sodium bisulphite.
5 pounds sulphuric acid.
49 steel pressure plates.
1 dozen sheets, cork.
6 dozen naturalist's vials.
2 badges (Quar. Officer and Dep. Quar. Officer).
1 mounted "flying fox."
3 small steel stamps for marking cuts.
1 tin funnel, with filter back.
1 glass funnel.
19 brass faucets.
3 gross slide labels.
1 frame for collecting parasites.
1 sack moss for packing parasites.
18 $\frac{3}{16}$ museum jars.
36 4½x11½ museum jars.
15 9x18 museum jars.
60 6x12x36 museum jars.
154 6x12 museum jars.
77 6x18 museum jars.
144 4½x12 museum jars.
36 10x12 museum jars.
72 ½-gal. top jars with cork lining.
62 1-qt. top jars with cork lining.
48 small top jars with cork lining.
54 cork sheets for lining specimen boxes.
1 towel rack.
750 specimen boxes for dried fruits.
24 books for preserving dried specimens.
1 hat rack.
Carpets covering 1,924 square feet of space.
20,000 bulletins (estimated) of different sorts.
2,500 reports (estimated) for 1891, 1892, and 1893–94.
4 counters with showcases with glass fronts, 3x12 feet.
2 counters with showcases with glass fronts, 3x18 feet.
70 boxes with specimens of different varieties of fruits, nuts, etc.
62 plates with specimens of different varieties of fruits, nuts, etc.
39 small boxes with pits of different fruits, for nomenclature.
12 plate-holders, 10x12.
24 plate-holders, 2x8.
6 dozen dry plates, 5x8.
1 dozen dry plates, 8x10.
1 large case for electrotypes and woodcuts.
3 small proofreading top desks.
3 awnings.
1,500 (estimated) envelopes for reports.
2,500 (estimated) wrappers for bulletins.
2 racks for bulletins, 8x16 feet.
2 racks (shelving for reports), 8x18 feet.
12 duck sacks for shipping reports, etc.
1 case nails.
10,000 lithographs, beneficial insects.
Assortment of dishes, etc., for experimenting.
928 woodcuts and electrotypes of different sizes, measuring 260 square feet.
1,859 books in library. (See catalogue.)
1 wrapping-paper holder—3 rolls.
$825 postage stamps of various denominations.

DEFICIENCY, ETC.

In accordance with law, the State Board of Examiners could not allow this Board to create a deficiency against the State, therefore we will be compelled to vacate these rooms and secure cheaper quarters, where all the property in our charge may be stored until some plan may be devised whereby we may continue operations. For two years past, aside from the office, we have conducted an experimental cellar, to find, if possible, a process for the treating of the ripe olive and convert it into a food product, as no satisfactory process was then known, and that branch of the industry was suffering. A process was discovered of great value to producers of olives in our State, and which was published in the report of the last Olive Growers' Convention. Therefore, your committee believes that enough was accomplished to warrant the maintenance of said cellar, the operation of which cost less than $1,000 for the two years, which includes rent, cost of tanks, furnace, and appliances, together with all the labor required in experiments continued over nearly two years, all of which will have to be stored with the other property.

Respectfully submitted.

J. L. MOSHER,
FRANK A. KIMBALL,
ELLWOOD COOPER,
Executive Committee.

On motion of Commissioner McDonald, the report of the Executive Committee was adopted and ordered entered in full upon the minutes.

The following letter was read from the State Board of Examiners:

JUNE 1, 1895.

B. M. LELONG, ESQ., *Secretary State Board of Horticulture*, 220 Sutter St., S. F., Cal.:

DEAR SIR: At a meeting of this Board, held on the 31st ult., your letter to Hon. L. W. Buck, and the letter from L. W. Buck, your Vice-President, were brought up.

According to the Act approved March 23, 1893 (Statutes of 1893. p. 285), the Governor, Secretary of State, and Attorney-General are given authority to allow a deficiency to be created *in excess of any appropriation of money made by law*, under certain conditions; but as the State Board of Horticulture has *no* appropriation for the forty-seventh and forty-eighth fiscal years, there cannot, therefore, be a deficiency when there is *no* appropriation, and therefore this Board has no power to allow your Board to create a deficiency as asked for.

Yours truly,

GEO. E. PRATT,
Secretary State Board of Examiners.

On motion, the above letter from the State Board of Examiners was ordered entered in full upon the minutes.

On moving from the old quarters in San Francisco, the question of ownership of partitions, etc., arose. The agent of the building claimed the same to belong to the building, in accordance with the "Tenement and Improvement Laws." To be on the safe side, the Attorney-General was asked for an opinion, as follows:

JULY 27, 1895.

HON. W. F. FITZGERALD, *Attorney-General:*

DEAR SIR: Will you please furnish us with an opinion upon the following, viz.:

In 1887 this Board rented one large room for offices at 220 Sutter Street, and as the room was in such condition as to require partitions to be put in, an agreement (verbal) was made with the owner of the building, as follows: The rent of the room was fixed at $65 per month, the owner to put up the partitions and the Board to pay $85 per month until said partitions were paid for, when the rent would again be reduced to $65. This was done. The question now is, as to the ownership of the partitions, and our right to remove same. The agent of the building informs us that there is a law which provides that all partitions when attached to the building become permanent fixtures and cannot be removed. Please inform us if this is the case, and advise us what to do in the matter.

There are other partitions that were put in by the Board and for which the Board paid. Can we remove these. In the event that no partitions can be removed, can we take off the doors of said partitions, which are made of glass fronts and consist of four small doors and four large folding doors.

We are moving into the Mills Building in this city, and have given the agents notice that we will vacate the rooms on the last day of this month; it is therefore important that we should receive a reply at the earliest possible moment.

Thanking you for the same, I remain,

Yours truly,

B. M. LELONG,
Secretary.

His opinion, which barred us from removing any such partitions from the building, is as follows:

SAN FRANCISCO, July 31, 1895.

State Board of Horticulture, Mills Building, City:

GENTLEMEN: Replying to your favor of the 27th inst., and to your questions concerning your right to remove certain partitions and certain doors connected with said partitions, I am of the opinion:

First—That these partitions put in at your request by the owners, and for which you were required to pay an additional rental to cover the cost of putting them in, do not, in the absence of any special agreement to that effect, belong to your Board, and that, therefore, you have no right to remove them.

Second—That as to the partitions put in and paid for by the Board, the question as to whom they belong is more doubtful. However, if fixtures of this character are removed in any event by a tenant, they can only be removed during the term of the lease under which they were put in; and as the original lease terminated long since, and as you did not make a reservation or agreement with your landlord for the removal of these partitions, I am of the opinion that they cannot be removed.

Third—That the doors to which you refer are a part of the partitions, and therefore cannot be removed by you.

Respectfully,

W. F. FITZGERALD,
Attorney-General.

The items of expenditures from July 1st to October 1st, are as follows:

Janitor		$21 50
Expressage, cartage, and telegrams		6 85
Traveling expenses of Commissioners		22 50
Supplies		9 60
Extra help, painting, etc.		34 65
Moving furniture, fixtures, etc.		55 00
Interest		40 67
Rent, July (front rooms)		50 00
Rent, July (rear rooms)		35 00
Rent, August (storeroom)		15 00
		$290 77
Receipts.		
Donations	$270 00	
Sale of parasites	15 00	
		$285 00
Deficiency		$5 77

Outstanding bills to date:

Carpet Cleaning Co., cleaning and laying carpets	$31 75
Sketches	75 00
Miscellaneous printing and supplies	20 25
Subscriptions to papers, about	50 00
Rent of storeroom, September and October	30 00
	$207 00
Subscriptions due November 1, 1895	50 00
Total deficiency	$162 77

The fiscal year closed July 1, 1895, and the following are the expenditures for the year:

Office furniture	$38 85
Papers	61 40
Library	15 00
Janitor	205 00
Traveling expenses of Commissioners	814 85
Cartage	147 93
Freight	235 05
Woodcuts and electrotypes	173 21
Miscellaneous printing	200 75
Salary of Special Agents	911 25
Traveling expenses of Quarantine Officer	371 95
Traveling expenses of Secretary	278 80

Sketches and drawings	$226 08
Rent	1,620 00
Salary of Deputy Quarantine Officer	455 50
Repairing	282 13
Experimenting	1,268 80
Telegrams and telephone	152 20
Eighteenth Fruit-Growers' Convention	215 00
Sundries	295 89
Office supplies	97 07
Pure food exhibit	197 95
Postage	1,689 65
Expressage	45 05
Total	$9,999 36
State appropriation	10,000 00
Balance	$0 64

Commissioner Block offered the following resolution, which was, upon motion, adopted:

> WHEREAS, The State made no appropriation for rent of rooms, nor any other incidental expenses for the State Board of Horticulture; and whereas, Mr. D. O. Mills subscribed an amount representing in rent a sum of $3,720 for two years, ending July 1, 1897; also donated the necessary heating, lighting, and janitor service; therefore, be it
>
> *Resolved*, That the thanks of this Board be tendered to Mr. Mills for his generosity and public spirit.

Commissoner Kimball moved that a committee of three be appointed on offices, etc., to interview the Mayor of San Francisco as to securing rooms in the City Hall, to act in conjunction with the President. Motion carried.

The President appointed Commissioners McDonald and Mosher and Secretary B. M. Lelong.

Commissioner McDonald moved that the question of removal, rent, etc., be referred to same committee. Adopted.

Commissioner Cooper called attention to the law relating to vacancies, and that a vacancy now existed in the office of Vice-President, caused by the death of Vice-President Buck.

Commissioner Kimball moved that the Board proceed to the election of a Vice-President, to fill the unexpired term of Vice-President L. W. Buck, deceased. Motion carried.

Commissioner Kimball nominated Commissioner McDonald, and moved that the Secretary be instructed to cast the vote of the Commissioners present for Colonel McDonald; whereupon, President Cooper declared him duly elected.

Vice-President McDonald thanked the Board for their confidence and the honor bestowed on him, and said he felt a delicacy in undertaking to fill a place occupied by the Commissioner we have just lost, and promised to serve to the best of his ability.

On motion, the President and Secretary were instructed to notify the Governor of the death of Commissioner Buck.

On motion, the Board adjourned to meet at the call of the Chair.

SACRAMENTO, November 4, 1895, 2 P. M.

President Cooper called the meeting to order, and the following Commissioners answered to their names: Cooper, Block, Thomas, Miles, and Runyon. Absent: McDonald, Mosher, and Kimball.

The minutes of the meeting of June 7, 1895, were read and approved.

Letters were read from Commissioners Kimball, McDonald, and Mosher, each regretting his inability to attend.

The report of the Secretary was read, and upon motion, was received and ordered placed on file.

The report of the Quarantine Officer was read, and was, upon motion, ordered placed on file.

A recess was then taken to meet at the call of the President.

Sacramento, November 4, 1895, 7:30 p. m.

As per call from President Cooper, and in pursuance to adjournment, the Board met at 7:30 o'clock p. m. There were present Commissioners Cooper, Thomas, Block, Runyon, and Miles. Absent: Commissioners McDonald, Kimball, and Mosher.

Letters were read from Messrs. A. B. Chapman, of San Gabriel, Timothy Hopkins, of Menlo Park, Nathan B. Blanchard, of Santa Paula, The Limonia Company, of Ventura, Saratoga Packing Company, of Los Gatos, E. E. Goodrich, of Santa Clara, and others, transmitting certain amounts for use of the Board.

On motion of Commissioner Block, a special vote of thanks was tendered to each for their generosity and public spirit.

San Francisco, May 6, 1896.

President Cooper in the chair.

Commissioner Kimball offered the following resolution:

Resolved, That the offices of the Board be moved to the State Capitol, at Sacramento, in accordance with Governor Budd's wishes.

Adopted.

Commissioner Buck moved that such removal take place as soon as sufficient funds can be provided to defray the expenses of removal, and that the Executive Committee be requested to confer with the Governor to this end. Carried.

Commissioner Kimball moved that December 1st, 2d, 3d, and 4th be fixed as the time for the next State Fruit-Growers' Convention. Carried.

Commissioner Buck moved that the next convention be held at the State Capitol, at Sacramento. Carried.

Commissioner Kimball moved that Commissioners Stephens and Miles and the Secretary be appointed a committee on arrangements for the next convention. Carried.

Also, that Commissioner Buck and the Secretary be appointed a committee on essays and programme. Carried.

Adjourned to meet at call of President.

EXPENDITURES.

Since we have established our offices in the State Capitol, in accordance with the Governor's wish, our expenses have been nominal, as our supplies are furnished by the Secretary of State, as well as light, etc. The offices are well equipped and are all that could be desired. Postage stamps are among our heaviest items of expense, but these were provided; so that the expenses in conducting the affairs of the Board, including moving to the Mills Building from 220 Sutter Street, and from San Francisco here, were nominal, as follows:

Telegrams and expressage	$29 05
Traveling expenses	216 95
Rent of storeroom in San Francisco	185 00
Extra help	144 25
Interest	55 17
Installing and repairs	143 71
Cartage and freight	203 91
Papers	33 30
Books	15 50
Translation	10 75
Printing	7 25
Sundries	142 53
Postage (extra)	10 50
Janitor	45 00
Expenses of clerk	100 00
Distributing parasites	74 17
Total	$1,417 04
Receipts, all sources	1,243 80
Deficit	$173 24
Bills outstanding	142 29
Total deficit	$315 53

Matters of great import are constantly being reported and investigations are made promptly. Our offices are now located on the first floor of the State Capitol, with a workroom on the third floor, and we use the garret for storage.

ELLWOOD COOPER,
President.

Attest:
B. M. LELONG,
Secretary.

VI.

INSECT PESTS AND TREE DISEASES LIABLE TO BE INTRODUCED INTO THE STATE, AND ESPECIALLY TO BE GUARDED AGAINST.

While the strictest quarantine against insect pests and the tree diseases has been maintained by this Board, ably seconded by the County Boards of Horticultural Commissioners throughout the State, a note of warning against injurious insect pests and diseases, and their possible introduction at this time, should not be passed unheeded.

Among the numerous pests abounding in foreign countries and the Eastern States, which should be especially guarded against, are the following which are briefly described, with notes and comments by scientists:

THE PEAR PSYLLA.

Psylla pyricola, Foster.

(Plate I, Fig. 7.)

This insect, of European introduction, has caused great loss to pear crops of New York. While it has been known for several years, the damage inflicted has been greater in the past five years, and the loss sustained by its ravages has been enormous. In Bulletin No. 108, of the Cornell University Experiment Station, its life-history and distribution are given, showing it to have spread from Salisbury, Conn., where it made its first appearance in 1832, to Massachusetts, New York, Illinois, Maryland, Virginia, and Canada.

This insect belongs to the family of insects known as jumping plant-lice, from the leaping habit of the adult insects.

> "During severe attacks of this pest, old trees put forth but little new growth, new shoots often droop and wither in May, the leaves turn yellow, and the fruit grows but little, and in midsummer the leaves and half-formed fruit often fall from the trees. The insect also indicates its presence by secreting large quantities of a sweet, water-like, sticky liquid, called "honey-dew," which often covers all parts of the tree; it has literally rained from the leaves, in some cases, and smeared the backs of horses during cultivation. A black fungus soon grows all through this honey-dew, and thus gives the tree a disgusting, blackish appearance, as if treated with a thin coat of black paint or soot. Pear trees, of all varieties and ages, are attacked in this State [New York]. Although the indications of the presence of some enemy is so conspicuous, the depredator is so small as to be easily overlooked." (Professor Slingerland, in Bulletin No. 108, Cornell University Experiment Station.)

This insect spreads from orchard to orchard somewhat slowly, but in nearly all cases reported it has been taken to other localities on pear stocks.

NEW YORK PLUM SCALE.

Lecanium juglandis, Bouche.

This scale insect has caused much damage to the plum trees of western New York, especially in 1894. The Cornell University Experiment Station, in the December bulletin (No. 83) of that year, discussed the damage done in detail, and mentioned the great losses sustained. Bulletin No. 108, January, 1896, says:

> "The serious picture we drew in Bulletin 83 of the ravages of the insect did not tell half the truth. Before the winter was far advanced, it was found that the strain on

many trees from so many millions of little pumps sucking out their vital fluid—the sap—had been too great. In one orchard three hundred of the oldest bearing trees had succumbed in January, and three hundred more died before spring."

This scale is of European introduction, and from accounts given by entomologists, is a very serious pest. Scale insects are very easily transported on nursery stock, and the greatest care must therefore be exercised in this respect. So far its presence seems to be confined to western New York, and the plum appears to be its food plant in particular.

THE BUD MOTH.

Tmetocera ocellana.

(Plate I, Fig. 9.)

This insect has of late played great havoc in the apple orchards of western New York, and is considered by the growers of that State to be one of the most destructive to orchards, and one of the most difficult to destroy. This bud moth is closely allied to the codlin moth, which it resembles in size and form, but differs from it in structure, in color, and in its habits.

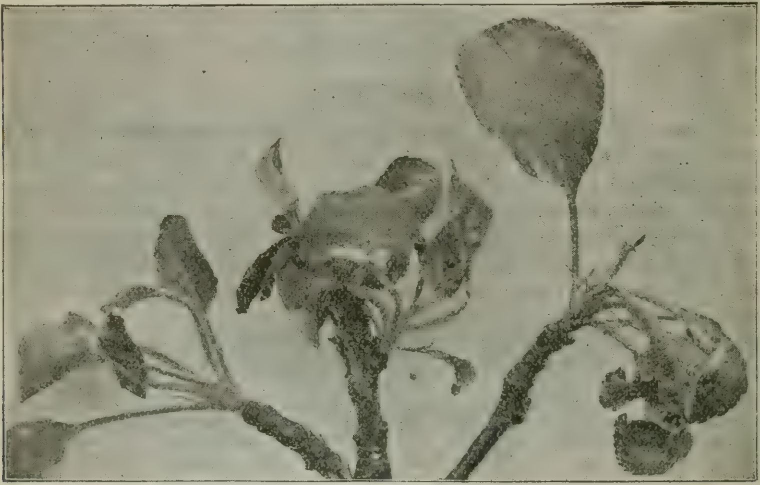

Fig. I. Work of the bud moth in opening leaf buds.

"This bud moth has come to be recognized by many of the most extensive apple-growers in western New York as the most injurious and hardest to fight of any insect now present in their orchards. It works in the opening leaf and flower buds, and often nearly the whole crop on many trees is destroyed while yet in the bud. It is also especially destructive when it attacks recently budded or grafted trees and nursery stock. Besides apple, it also feeds upon pear, plum, cherry, quince, and peach trees, and blackberry buds. Thus the fruit-growers have to fear, in the bud moth, a pest which is capable of literally 'nipping in the bud' a prospective crop of fruit, a graft, or budded stock." (Bulletin No. 107, Cornell University Experiment Station, p. 57.)

This moth is of European introduction and has been known in Europe for over half a century. In the East it was first discovered in Massachusetts in 1869, where it did much damage. The same year it also appeared in Pennsylvania, where it also did considerable damage, and in 1870 made its appearance in Canada, attacking plum trees. In

1879 it was found in Washington, D. C., and in 1885 in Nova Scotia. It was discovered in 1887 in Rochester, and in 1888 and 1890 in Maine, where it proved very injurious, damaging the apple and blackberry crops.

> "Throughout Massachusetts, New York, and Canada the insect appeared in very destructive numbers in 1891, and in Michigan in 1892. It has been found in Missouri and two or three years ago was introduced into Idaho." (Bulletin No. 107, Cornell University Experiment Station, p. 58.)

Thus it will be seen that we have the insect near the border-line, and nothing but strict vigilance will stop its introduction into our State. The moth spreads very rapidly, but is most easily transported from one locality to another on nursery trees. The larva of the moth, in its half-grown state, passes the winter hidden under the flaps of buds, of the small limbs or twigs, or under some other convenient place, and in the spring makes its appearance in the locality where the tree is transported. The moth is reported to have but one brood a year, and usually lays its eggs in June and July. The caterpillars hibernate when half-grown.

This insect has so far proved very hard to combat, and no effective remedy has as yet been discovered.

THE PLUM CURCULIO.

Canotrachelus nenuphar, Herbert.

This insect is a very dangerous pest, and the most injurious known to the plum family. It abounds throughout the Eastern States, where, owing to its ravages, the culture of the plum and apricot has almost been abandoned. It also attacks the peach, the cherry, and the nectarine. So far it has baffled all efforts put forth to combat it. No effective remedy has as yet been found. We have exercised the greatest vigilance to prevent its introduction into our State, for should it appear here the prune interest would suffer immensely, and its culture will have to be abandoned.

THE GYPSY MOTH.

Ocneria dispar.

In 1868 this insect was introduced into Massachusetts from Europe by a Frenchman, with the view of experimenting with them for raising silk. Instead of proving beneficial they have caused great damage to that State, entailing an expense of $300,000 annually in combating them. All efforts in this direction have as yet proved only temporary, and whether the insect will ever be exterminated, time can only determine.

This insect feeds on apple, plum, cherry, quinçe, elm, linden, locust, maple, birch, oak, willow, poplar, arbor vitæ, and numerous other plants, including poison ivy, and in fact it is a question if any tree or plant would be exempt from its attacks. (See Plate III.)

THE CIGAR-CASE BEARER.

Coleophora fletcherell, Fernald.

(Plate I, Fig. 5.)

During 1894 the orchards of western New York suffered immensely from the attacks of this insect, which is considered a very serious pest. This insect is widely distributed throughout the State of New York, and is also very numerous in Canada and Nova Scotia. The species is very small and of peculiar habits in all its stages, and is therefore difficult to notice, except by the peculiar cases made by the larvæ, resembling a miniature cigar, through which its presence is most easily observed. The moth is of a steel-gray color and very delicate.

> "Briefly summarized, the life-history of this case-bearer is as follows: The insect spends about seven months (from September 15th to April 15th) of its life in hibernation, as a minute, half-grown caterpillar, in a small case attached to a twig. In the spring the caterpillars attack the opening buds, the expanding leaves, the stems of the flowers and fruit, and the forming fruit. By May 20th the hibernating case, with its spring additions, is discarded for another and larger cigar-shaped case, which the caterpillar deftly makes from pieces of the upper and lower skins of the leaves. Protruding themselves from these cases, they eat through one skin of the leaf, and mine out the inner tissues over an irregular area as far as they can reach and not let go of their case. In the latter part of June, they cease feeding, securely fasten the cases to the leaves or branches, and change to pupæ within. The moth emerges in about three weeks, and soon lays minute, pretty yellow, pitted eggs among the hairs of the young leaves. The egg state lasts about two weeks, the little caterpillar emerging about July 15th. They work as miners in the tissue of the leaf for two or three weeks, then abandon their mining habit and construct their curious little curved cases from bits of the skins of the leaves. By September 15th they have all migrated to the twigs, whence they pass the winter in their cases." (Bulletin No. 93, Cornell University Experiment Station, p. 227.)

The insect is so very small that only an expert can detect its presence on nursery trees, therefore it can be seen what great care must be exercised to prevent its introduction into our State. (See Plates I and II).

PEACH YELLOWS.

In 1891 a bulletin on the peach yellows was issued by this Board, warning the fruit-growers to be more cautious in importing trees from regions in the East where the peach yellows abounds, lest the disease might be introduced here; together with a map showing its distribution, also, photo plates showing the great havoc wrought by it and what would be the ultimate results if it ever attained a foothold in our State. All the combined efforts of the experts employed have not as yet detected the cause of the malady nor effected a cure in a single instance.

> "If yellows exists in some parts of a State and not at all in others, I should consider it safe to import from non-infected regions (*a*) provided they are not very close to the infected regions, and (*b*) provided it can be shown that buds as well as stocks came from healthy localities. I should regard it as unsafe to get pits from infected districts. In reference to cions or buds, it is *very unsafe* to import them from infected districts." (Letter, dated August 24, 1891, from Prof. B. T. Galloway, Chief of the Division of Vegetable Pathology of the Department of Agriculture.)

> "Yellows is a distinct disease. It attacks peach trees of all ages and in all conditions of vigor, seeming to have preference for those which are thrifty. It is *incurable*, and its termination is always fatal. It is communicable from tree to tree. Extermination of all affected trees, root and branch, is the *only* method of keeping the disease at bay." (Prof. L. H. Bailey, Bulletin No. 75, Cornell University Experiment Station, 1894, p. 406.)

We could quote from innumerable authorities to show the great danger of its being introduced here and the devastating results that would follow, but those herein quoted being the highest in the country, we deem them sufficient. Prof. Erwin F. Smith, the specialist on the yellows and rosette, employed for many years by the Department of Agriculture, sounded a note of warning, as follows:

> "In peach-growing States now free from the disease it would be wise to prohibit the introduction of all trees from infected areas. Certainly, if yellows does not now occur in California (and by diligent inquiry I have failed to ascertain that it does), the greatest care should be taken to prevent its introduction, even to the extent of legislation strictly

prohibiting the importation of peach trees from the Eastern United States. Unless such steps are taken the appearance of yellows in orchards on the Pacific Coast is only a matter of time." (Bulletin No. 9, Section of Vegetable Pathology, Department of Agriculture, 1891, p. 177.)

In 1891, the fruit-growers in convention assembled at Marysville, passed the following resolutions:

Resolved, That it is the sense of this convention that our fruit industry is in imminent danger from the introduction of a disease known as "The Yellows," and infesting many of the fruit-growing sections of the East.

Resolved, That in view of all known facts regarding the disease, it is of vital importance to the fruit interests of this State that no trees grafted or budded upon peach stocks grown outside of the State of California, nor any buds, cions, cuttings, or pits from such trees, be imported into this State from Eastern States, even though such trees are apparently free from disease.

Resolved, That we pledge ourselves not to buy any such trees, buds, etc., and that we will discourage, in every proper way, their importation, and also that we will not deal with those who, from this time on, are known to import such trees from the East.

Resolved, That we believe that the Boards of Supervisors of the several counties of the State should use all the authority vested in them to exclude all Eastern stock grown on peach roots, or, if introduced, to use all lawful means to have them immediately destroyed.

Since then the most careful watch has been exercised over all shipments of trees from the East throughout the State, but the subject is deemed of so much importance that it was considered advisable to again call attention to the dangers that may befall us if the warnings are disregarded.* (See Plates IV and V.)

PEACH ROSETTE.

This is another deadly disease of the peach, but so far is not so generally distributed; nevertheless, it is as much to be feared as the yellows.

VII.

INSPECTIONS OF STEAMERS, ETC.

In the inspection of steamers and vessels, the same precaution has been exercised as formerly, to prevent the possible introduction of new insect pests or diseases on plants and trees brought here by passengers and importers from foreign countries, where such pests and diseases abound. In several countries these enemies to fruit culture have caused great loss to the growers and have made it almost impossible for them to continue the business. We have had the kind and valuable assistance and coöperation of the Custom-House officers, the Surveyor of the Port and his staff, and also of the Postmaster at San Francisco and the Postmaster-General, for which we beg to make due acknowledgment.

The following list comprises the number of vessels arriving at the port of San Francisco, and the number of plants, trees, etc. (and disposition made of same), inspected, from July 2, 1894, to August 29, 1896:

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*See Reports of Prof. Erwin F. Smith, Division of Vegetable Pathology, Department of Agriculture, 1888 and 1891. Also, Report of State Board of Horticulture, 1891.

List of Vessels that Arrived in the State with Trees or Plants on Board.

Date.	Vessel.	From.	Contents.	Disposition.
1894.				
July 2	Peru	China and Japan	4 sago palms in vases.	Clean, passed.
July 6	Monowai	Australia and New Zealand.	5 ferns in pots	Clean, passed.
July 21	City of Rio de Janeiro.	China and Japan	3 lots ornamental plants.	Part destroyed; sagos passed.
July 28	Australia	Honolulu	2 lots plants	Dipped.
July 30	Gaelic	China and Japan	5 cases orchids, 1 lot plants.	Clean.
Aug. 2	Alameda	Australia and New Zealand.	3 cases plants, 1 lot plants.	Part destroyed, others disinfected.
Aug. 10	City of Peking	China and Japan	5 raphis	Clean.
Aug. 18	China	China and Japan	7 lots plants	Part destroyed.
Aug. 25	Australia	Honolulu	8 boxes plants, 2 lots plants.	Part destroyed.
Aug. 28	Belgic	China and Japan	2 lots plants, cage Japanese live crickets.	Plants clean; crickets destroyed.
Aug. 30	Mariposa	Australia and New Zealand.	7 cases plants, 3 lots plants.	Fumigated.
Aug. 31	Acapulco	Central America	2 lots plants	Clean.
Sept. 11	San Blas	Central America	1 lot plants	Clean.
Sept. 16	Oceanic	China and Japan	2 cases orchids, 2 plants.	Orchids clean; plants destroyed.
Sept. 18	San Juan	Central America	2 cocoanut p'lms	Clean.
Sept. 22	Australia	Honolulu	6 plants	Clean.
Sept. 24	City of Rio de Janeiro.	China and Japan	1 lot plants	Part destroyed.
Sept. 29	Monowai	Australia and New Zealand.	A few ferns	Clean.
Sept. 30	Colon	Central America	3 palms	Clean.
Oct. 4	Gaelic	China and Japan	1 lot plants	Clean.
Oct. 11	City of Sydney	Central America	1 lot plants	Clean.
Oct. 20	Australia	Honolulu	1 lot plants	Destroyed.
Oct. 21	City of Peking	China and Japan	4 lots plants	Part destroyed.
Oct. 25	China	China and Japan	21 cases plants, 3 crates plants.	Part destroyed, others fumigated.
Oct. 26	Alameda	Australia and New Zealand.	2 cases plants, 6 lots plants.	Part fumigated.
Nov. 7	Belgic	China and Japan	2 crates plants, 2 cases plants.	Fumigated, and part destroyed.
Nov. 13	Peru	China and Japan	6 cases plants, 7 lots plants.	Part clean, others fumigated.
Nov. 17	Australia	Honolulu	3 lots plants	Clean.
Nov. 17	Galilee	Tahiti	1 box hibiscus	Disinfected.
Nov. 28	Oceanic	China and Japan	2 lots plants	Fumigated.
Dec. 1	San Juan	Central America	1 case orchids	Clean.
Dec. 3	City of Rio de Janeiro.	China and Japan	57 cases plants, 3 lots plants.	Part destroyed, others fumigated.
Dec. 11	Colon	Central America	2 lots plants	Part destroyed.
Dec. 14	Gaelic	China and Japan	49 cases plants	Fumigated, part destroyed.
Dec. 15	Australia	Honolulu	3 lots plants	Part destroyed.
Dec. 17	San José	Central America	1 plant	Clean.
Dec. 22	Arawa	Australia and New Zealand.	20 cases plants	Fumigated.
Dec. 23	City of Peking	China and Japan	36 cases plants	Part destroyed.
1895.				
Jan. 6	China	China and Japan	13 cases plants, 4 lots plants.	Part destroyed, others fumigated.
Jan. 12	Belgic	China and Japan	28 cases plants, 3 lots plants.	Part destroyed, others fumigated.
Jan. 21	Alameda	Australia and New Zealand.	3 lots plants	Dipped.

Vessels with Trees or Plants on Board—Continued.

Date.	Vessel.	From.	Contents.	Disposition.
1895.				
Jan. 23	Peru	China and Japan	7 cases plants, 8 lots plants.	Part destroyed, others fumigated.
Jan. 24	St. Paul	Mexican ports	2 palms	Clean.
Feb. 1	Oceanic	China and Japan	40 cases plants, 4 lots plants.	Part destroyed, others fumigated.
Feb. 6	Australia	Honolulu	2 lots plants	Destroyed.
Feb. 15	Mariposa	Australia and New Zealand.	1 box ferns	Clean.
Feb. 22	City of Sydney	Central America	2 boxes plants	Part destroyed.
Feb. 24	Gaelic	China and Japan	4 cherry trees	Destroyed.
Mar. 2	Australia	Honolulu	4 palms	Destroyed.
			Few ferns	Clean.
Mar. 2	City of Peking	China and Japan	46 cases plants	Fumigated.
Mar. 6	Acapulco	Central America	3 lots plants	Part destroyed.
Mar. 14	Colima	Central America	4 plants	Clean.
Mar. 14	Arawa	Australia, New Zealand, and Samoa.	1 box ferns	Clean.
Mar. 15	China	China and Japan	2 boxes and 1 crate plants.	Clean.
Mar. 20	St. Paul	Mexican ports	2 boxes plants, 2 lots plants.	Part destroyed.
Mar. 23	Belgic	China and Japan	2 lots plants	Clean.
Mar. 27	Australia	Honolulu	1 box plants	Part destroyed.
Apr. 2	Rio de Janeiro	China and Japan	20 cases pl'ts, 25 boxes orchids, 4 lots plants.	Part destroyed, others fumigated.
Apr. 6	San Juan	Central America	5 plants	Clean.
Apr. 8	Peru	China and Japan	2 cases plants, 2 lots plants.	Fumigated.
Apr. 11	Alameda	Australia and New Zealand.	5 lots ferns	Clean.
Apr. 16	Colon	Central America	Caladium	Clean.
Apr. 19	Coptic	China and Japan	1 case roots	Clean.
Apr. 21	Australia	Honolulu	3 lots plants	Disinfected.
May 2	Acapulco	Central America	8 orchids	Clean.
May 8	City of Everett	Puget Sound	3 sago palms, 3 plants.	Clean.
May 9	Mariposa	Australia, New Zealand, and Samoa.	6 lots plants	Part destroyed.
May 12	City of Peking	China and Japan	5 lots plants	Part destroyed.
May 12	Colima	Central America	6 palms	Clean.
May 23	San Blas	Central America	6 ferns	Clean.
May 26	China	China and Japan	4 cases plants, 6 plants	Fumigated.
June 2	Belgic	China and Japan	2 lots plants	Clean.
June 8	Monowai	Australia, New Zealand, and Samoa.	3 lots plants	Clean.
June 12	Colon	Central America	Caladium	Clean.
June 13	Peru	China and Japan	1 palm	Clean.
June 24	Coptic	China and Japan	2 lots plants	Clean.
July 1	Australia	Honolulu	5 lots plants	Part destroyed.
July 3	Alameda	Australia and New Zealand.	7 lots plants	Part destroyed.
July 5	City of Rio de Janeiro.	China and Japan	5 lots plants	Part destroyed.
July 12	San José	Central America	2 lots plants	Destroyed.
July 12	Gaelic	China and Japan	2 plants	Clean.
July 17	City of Papeete	Tahiti	2 palms	Clean.
July 18	Willamette Valley	Mexican ports	1 lot plants	Destroyed.
July 19	San Blas	Central America	1 box orchids	Clean.
July 25	City of Peking	China and Japan	4 lots plants	Part destroyed.
July 27	Australia	Honolulu	5 lots plants	Part destroyed.
July 30	Umatilla	Puget Sound	2 lots plants	Clean.
Aug. 1	China	China and Japan	3 lots plants	Clean.
Aug. 1	Mariposa	Australia, New Zealand, and Samoa.	6 lots plants	Clean.
Aug. 14	Umatilla	Puget Sound	3 lots plants	Clean.
Aug. 15	Colon	Central America	1 case orchids	Clean.
Aug. 15	Galilee	Tahiti	2 boxes oranges	Destroyed.
Aug. 17	Gaelic	China and Japan	2 lots plants	Part destroyed.

VESSELS WITH TREES OR PLANTS ON BOARD—Continued.

Date.	Vessel.	From.	Contents.	Disposition.
1895.				
Aug. 21	Australia	Honolulu	2 lots plants	Part destroyed.
Aug. 24	Peru	China and Japan	6 lots plants	Clean.
Aug. 28	Lurline	Hawaii	100 trees—fern trunks.	Clean.
Aug. 28	W. G. Irwin	Hawaii	16 palms	Part destroyed.
Aug. 29	Umatilla	Victoria	Few ferns	Clean.
Aug. 30	Monowai	Australia and New Zealand.	3 cases plants, 2 lots plants.	Part destroyed.
Aug. 31	Coptic	China and Japan	2 lots plants	Clean.
Sept. 3	City of Puebla	Victoria	2 lots ferns	Clean.
Sept. 8	Walla Walla	Victoria	3 lots ferns	Clean.
Sept. 13	Umatilla	Victoria	1 box plants	Clean.
Sept. 14	Willamette Valley	Mexican ports	2 lots plants	Part destroyed.
Sept. 18	City of Puebla	Victoria	1 bouvardia	Clean.
Sept. 19	City of Rio de Janeiro.	China and Japan	9 palms	Clean.
Sept. 21	Gaelic	China and Japan	3 lots plants	Part destroyed.
Sept. 23	Walla Walla	Victoria	2 plants	Clean.
Sept. 26	Alameda	Australia and New Zealand.	1 case plants, 5 lots plants.	Part destroyed, others fumigated.
Oct. 2	City of Peking	China and Japan	4 cases plants, 5 lots plants.	Part destroyed, others fumigated.
Oct. 3	City of Puebla	Victoria	1 box plants	Clean.
Oct. 3	San Juan	Central America	1 plant	Destroyed.
Oct. 4	Jennie Wand	Hawaii	3 lots ferns	Part destroyed.
Oct. 8	Walla Walla	Victoria	2 lots plants	Clean.
Oct. 9	Mary Dodge	Marquesas Islands	10 plants	Part destroyed, others dipped.
Oct. 14	China	China and Japan	2 cases plants	Part destroyed.
Oct. 18	City of Puebla	Victoria	1 holly	Clean.
Oct. 19	Willamette Valley	Mexican ports	1 lot plants, 505 boxes oranges.	Clean, fumigated.
Oct. 23	Walla Walla	Victoria	2 bundles trees, 2 ferns.	Clean.
Oct. 24	Mariposa	Australia and New Zealand.	3 cases plants, 4 lots plants.	Part destroyed.
Oct. 25	City of Papeete	Tahiti	1 box vanilla plts	Clean.
Oct. 26	San José	Central America	4 lots plants	Fumigated.
Oct. 29	Kahului	Hawaii	2 lots plants	Part destroyed.
Oct. 30	Progresso	Central America	1 box plants	Part destroyed.
Nov. 2	City of Puebla	Victoria	Ornamental plts	Clean.
Nov. 2	Peru	China and Japan	22 cases plants, 4 lots plants.	Part destroyed, others fumigated.
Nov. 2	Australia	Honolulu	1 basket palms	Clean.
Nov. 7	Columbia	Portland	9 pkgs. blackberry roots.	Clean.
Nov. 10	City of Sydney	Central America	1 box orchids	Clean.
Nov. 12	Umatilla	Victoria	1 bundle plants	Clean.
Nov. 13	Coptic	China and Japan		
Nov. 14		Portland	2 bundles roses	
Nov. 17	City of Puebla	Victoria	3 plants	Clean.
Nov. 17	Willamette Valley	Mexican ports	1 basket ferns, 900 bxs. oranges.	Clean.
Nov. 22	Monowai	Australia and New Zealand.	2 lots plants	Clean.
Nov. 27	Australia	Honolulu	5 lots plants	Part destroyed.
Nov. 29	Gaelic	China and Japan	1 vase plants	Destroyed.
Dec. 8	San Juan	Central America	1,000 seedling coffee, 2 lots.	Clean, part destoyed.
Dec. 13	City of Peking	China and Japan	4 boxes ladybirds for colonization.	
Dec. 18	Willamette Valley	Mexican ports	2 lots plants (mining scale).	Destroyed.
Dec. 19	Alameda	Australia and New Zealand.	2 lots plants	Clean.
Dec. 23	Australia	Honolulu	1 case plants	Clean.

VESSELS WITH TREES OR PLANTS ON BOARD—Continued.

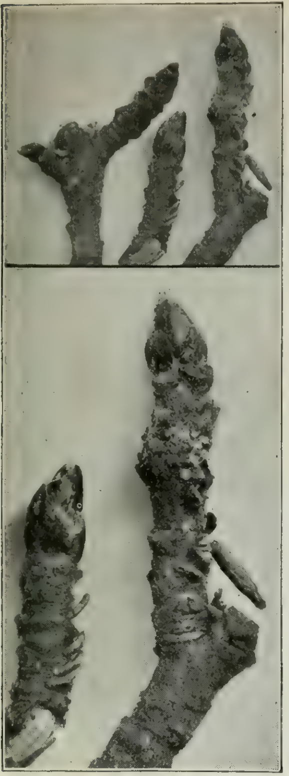
Date.	Vessel.	From.	Contents.	Disposition.
1896.				
Jan. 4	Alfridi	China and Japan	589 bxs. oranges	Clean.
Jan. 11	Peru	China and Japan	189 cases plants, 6 bxs. pomelo.	Part destroyed, others fumigated.
Jan. 14	Australia	Honolulu	2 lots plants	Part destroyed.
Jan. 16	Willamette Valley	Mexican ports	4 lots plants	Part destroyed.
Jan. 16	Mariposa	Australia and New Zealand.	3 palms	Destroyed.
Jan. 21	Coptic	China and Japan	17 cases plants, 3 lots plants.	Part destroyed, others fumigated.
Jan. 31	City of Rio de Janeiro.	China and Japan	64 cases plants, 2 lots plants.	Part destroyed, others fumigated.
Feb. 7	Gaelic	China and Japan	84 cases plants, 1 lot plants.	Part destroyed, others fumigated.
Feb. 9	Australia	Honolulu	1 case fern trunks.	Clean.
			4 lots plants.	Part destroyed.
Feb. 11	Zealandia	Central America	2 palms	Destroyed.
Feb. 12	San Juan	Central America	3 plants	Clean.
Feb. 16	Monowai	Australia and New Zealand.	2 lots plants	Part destroyed.
Feb. 18	City of Peking	China and Japan	44 cases plants, 4 lots plants.	Part destroyed, others fumigated.
Feb. 19	Willamette Valley	Mexican ports	6 palms, 250 boxs tomatoes.	Clean.
Feb. 23	San José	Central America	2 lots plants	Clean.
Feb. 27	Belgic	China and Japan	28 cases plants, 1 lot plants.	Part destroyed, others fumigated.
Mar. 5	Australia	Honolulu	2 lots plants	Part destroyed.
Mar. 5	China	China and Japan	6 crates plants	Fumigated.
			2 lots plants	Clean.
Mar. 11	Umatilla	Victoria	1 raphis	Clean.
Mar. 12	Alameda	Australia and New Zealand.	17 pkgs. tree fern trunks.	Clean.
			9 lots plants	Part destroyed.
Mar. 13	Kahului	Hawaii	2 lots plants	Part destroyed.
Mar. 19	City of Sydney	Central America	1 pkg. orchids	Clean.
Mar. 20	Peru	China and Japan	17 cases plants	Fumigated.
			4 lots plants	Clean.
Mar. 25		Central America	1 pkg. orchids	Part destroyed.
Mar. 27	Coptic	China and Japan	17 cases plants	Eastern States.
			15 cases sago stems.	Clean.
Mar. 28	Australia	Honolulu	260 pkgs. pineapple plants.	For Florida.
			5 lots plants	Part destroyed.
Mar. 31	City of Puebla	Victoria	2 lots plants	Clean.
Mar. 31	Willamette Valley	Mexican ports	4 lots plants	Part destroyed.
Apr. 9	City of Rio de Janeiro.	China and Japan	2 lots plants	Clean.
Apr. 9	Mariposa	Australia and New Zealand.	3 cases tree fern trnks.	Clean.
			5 lts plts.	Part destroyed.
Apr. 13	San Blas	Central America	1 pkg. plants	Clean.
Apr. 19	Gaelic	China and Japan	12 cases plants,	Fumigated.
			pair mongoose	Killed.
Apr. 20	Zealandia	Central America	1 medicinal plt	Clean.
Apr. 22	Santiago	Hawaii	12 ferns	Clean.
Apr. 23	Australia	Honolulu	7 lots plants	Part destroyed.
Apr. 24	City of Peking	China and Japan	4 cases plants, 5 lots plants.	Part destroyed, others disinfected.
Apr. 25	San Juan	Panama	1 case filbert plts frm Italy.	Plants dead.
Apr. 28	Orizaba	Mexican ports	3 lots plants	Part destroyed.
Apr. 30	City of Puebla	Victoria	2 lots plants	Clean.
May 1	Doric	China and Japan	4 cases plants	Fumigated.
			1 lot plants	Clean.
May 3	Colon	Central America	2 lots plants	"Mining scale," destroyed.
May 9	Monowai	Australia and New Zealand.	1 box ferns	Destroyed.
May 12	China	China and Japan	1 case plants	Eastern States.
			4 sago palms	Clean.

VESSELS WITH TREES OR PLANTS ON BOARD—Continued.

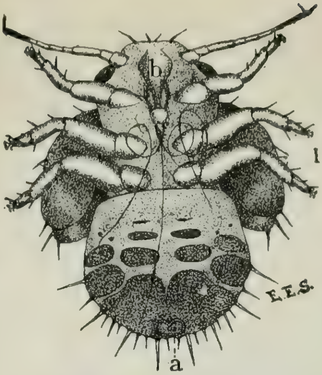
Date.	Vessel.	From.	Contents.	Disposition.
1896.				
May 16	City of Sydney	Central America	3 lots plants	Part destroyed.
May 16	Australia	Honolulu	4 boxes pineapple plants.	For Florida.
			3 lots plants	Part destroyed.
May 20	Walla Walla	Victoria	1 plant	Clean.
May 20	Belgic	China and Japan	3 crates plants.	Part destroyed.
			3 lots plants	Clean.
May 26	Orizaba	Mexican ports	5 lemon trees	Destroyed.
May 28	San Blas	Central America	1 caladium	Clean.
June 4	Walla Walla	Victoria	2 lots plants	Clean.
			326 boxes apples.	Fumigated (scale).
June 4	Alameda	Australia and New Zealand.	6 lots plants	Part destroyed.
June 5	Peru	China and Japan	4 cases plants, 5 lots plants.	Disinfected.
June 10	Australia	Honolulu	41 bundles tree fern trunk.	Clean.
June 12	Coos Bay	Mexican ports	2 palms	Clean.
June 12	Acapulco	Central America	6 plants	Clean.
June 14	City of Puebla	Victoria	1 bundle plants.	Clean.
June 14	City of Para	Central America	4 palms	Destroyed.
June 16	Coptic	China and Japan	4 lots plants	Clean.
June 18	Newport	Valparaiso	1,000 sks waln'ts	
June 19	Walla Walla	Victoria	100 boxes of Australian apples.	Owners refused to fumigate; sent them back.
June 20	City of Rio de Janeiro.	China and Japan	2 lots plants	Clean.
June 26	Kahului	Hawaii	4 plants	Destroyed.
June 27	Orizaba	Mexican ports	3 lots plants	Clean.
			1 sack dried fruit	Destroyed.
June 29	City of Puebla	Victoria	1 fern	Clean.
July 2	Mariposa and New Zealand.	Australia	2 lots plants	Part destroyed.
July 4	Walla Walla	Victoria	1 basket plants	Clean.
July 5	City of Peking	China and Japan	6 lots plants	Part destroyed.
July 6	Australia	Honolulu	6 lots plants	Part destroyed.
			20 sacks pineapple plants.	For Florida.
July 12	Doric	China and Japan	3 lots plants	Clean.
July 15	Wrecked Columbia, per tug Active	Central America	Lot of orchids and ferns.	Clean.
July 19	China	China and Japan	3 lots plants	Clean.
July 24	Umatilla	Victoria	1 box ferns	Clean.
July 25	Orizaba	Mexican ports	Several plants	Part destroyed.
July 28	Australia	Honolulu	1 lot plants	Clean.
July 29	City of Puebla	Victoria	7 raspberry pl'ts.	Clean.
July 29	Mexico		1 lot ferns	Clean.
July 30	San Blas	Central America	1 plant	Clean.
July 30	Monowai	Australia and New Zealand.	4 plants	Clean.
Aug. 8	Umatilla	Victoria	3 lots plants	Clean.
Aug. 9	Peru	China and Japan	4 lots plants	Part destroyed.
Aug. 13	City of Puebla	Victoria	2 boxes ferns	Clean.
Aug. 13	Coptic	China and Japan	4 lots plants	Clean.
Aug. 16	City of Para	Central America	Coffee branches with berries.	Clean.
Aug. 18	Walla Walla	Victoria	1 box plants from Alaska.	Clean.
Aug. 21	Orizaba	Mexican ports	4 boxes cactus	Clean.
			6 plants	Destroyed.
Aug. 22	Australia	Honolulu	245 sks. pineapple plants.	For Florida.
			7 lots plants	Part destroyed.
Aug. 24	Acapulco	Central America	2 lots plants	Destroyed.
Aug. 24	Galilee	Tahiti	1 plant	Clean.
Aug. 27	Alameda	Australia and New Zealand.	4 cases araucaria.	
			4 lots plants	
Aug. 29	City of Rio de Janeiro	China and Japan	3 lots plants	Clean.

EASTERN INSECTS LIABLE TO BE INTRODUCED INTO THE STATE.

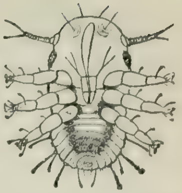
PLATE I.



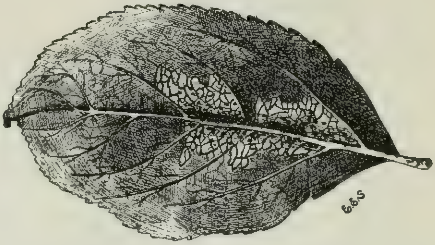
1—The small curved cases in which the cigar-case bearer caterpillars hibernate on the twigs; the upper part of the figure is natural size, while the two lower twigs are twice natural size.



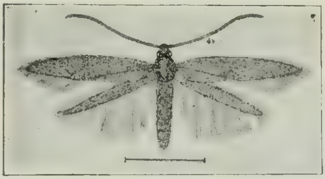
2—Full-grown nymph of the pear psylla, ventral view, greatly enlarged.



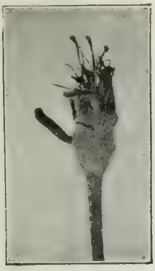
3—Newly hatched nymph of pear psylla, ventral view, greatly enlarged. (Reduced from figure by U. S. Dept. of Agri.)



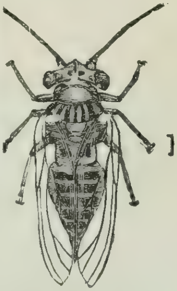
4—Leaf showing the work of a young caterpillar of bud moth during the summer.



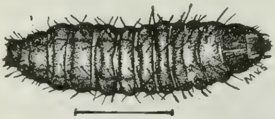
5—Cigar-case bearer—adult insect, about four times natural size.



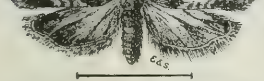
6—A cigar-case bearer attached to a young pear which it had killed; natural size.



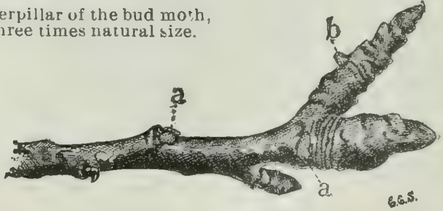
7—Psylla pyricola, the adult insect, much enlarged.



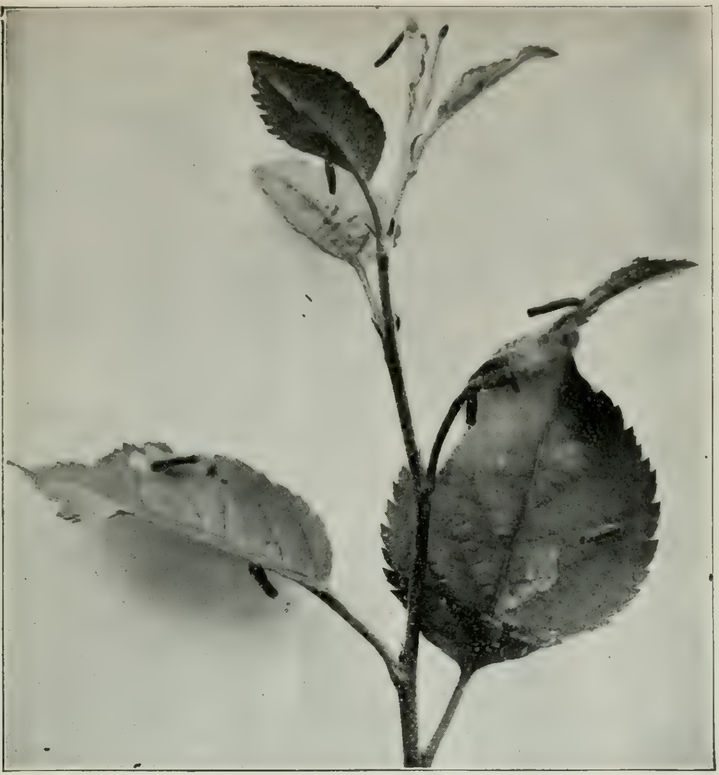
8—Caterpillar of the bud moth, about three times natural size.



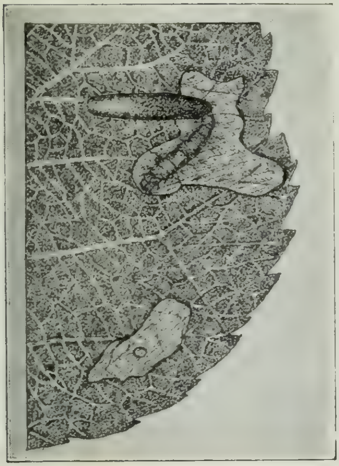
9—The bud moth—the adult insect, twice natural size.



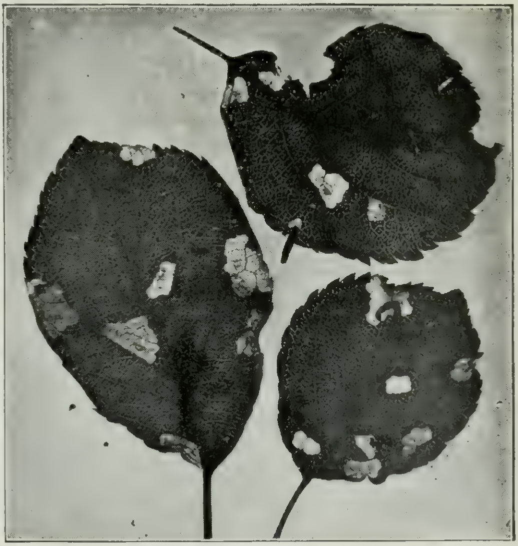
10—Twig showing the position of the winter homes of the caterpillar of cigar-case bearer at *a*, *a*, and *b*, natural size.



1—Cigar-case bearers at work; natural size.

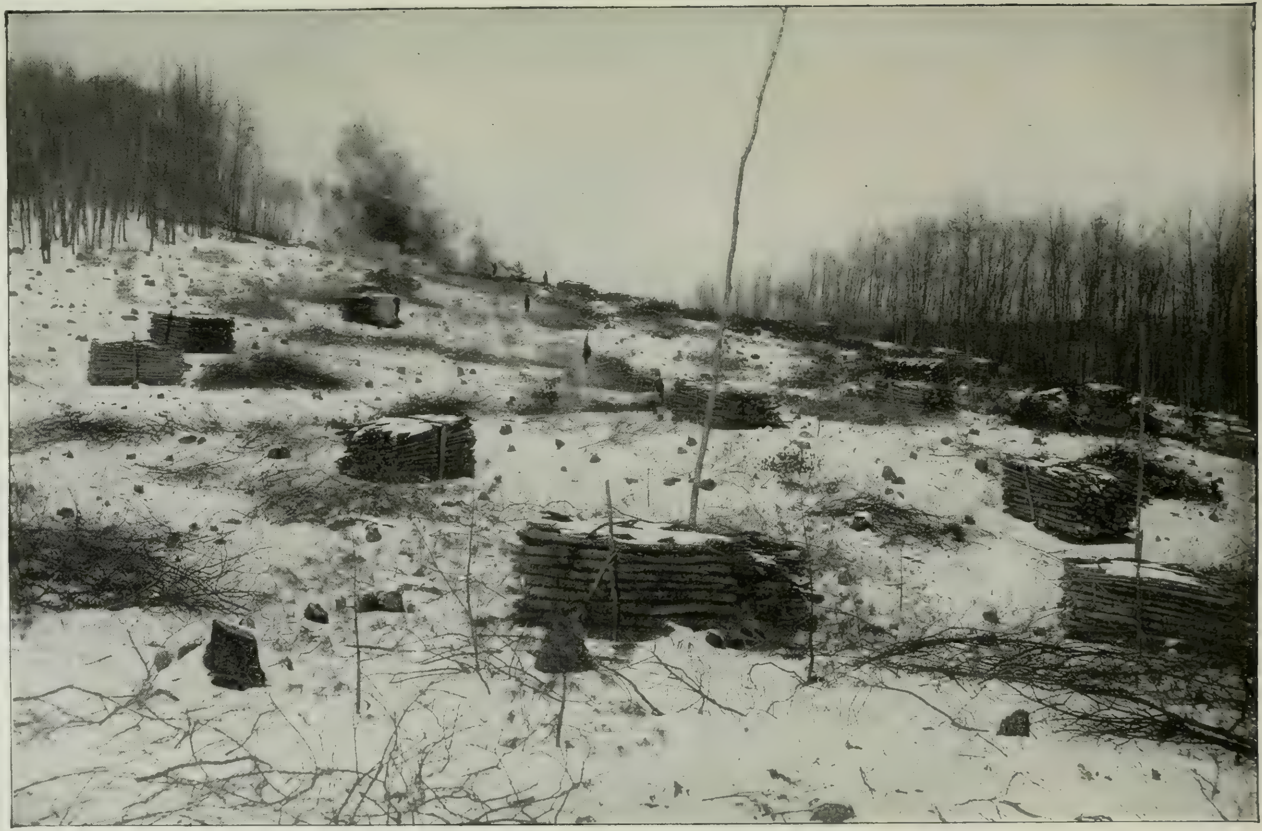


2—A cigar-case bearer caterpillar feeding; much enlarged.

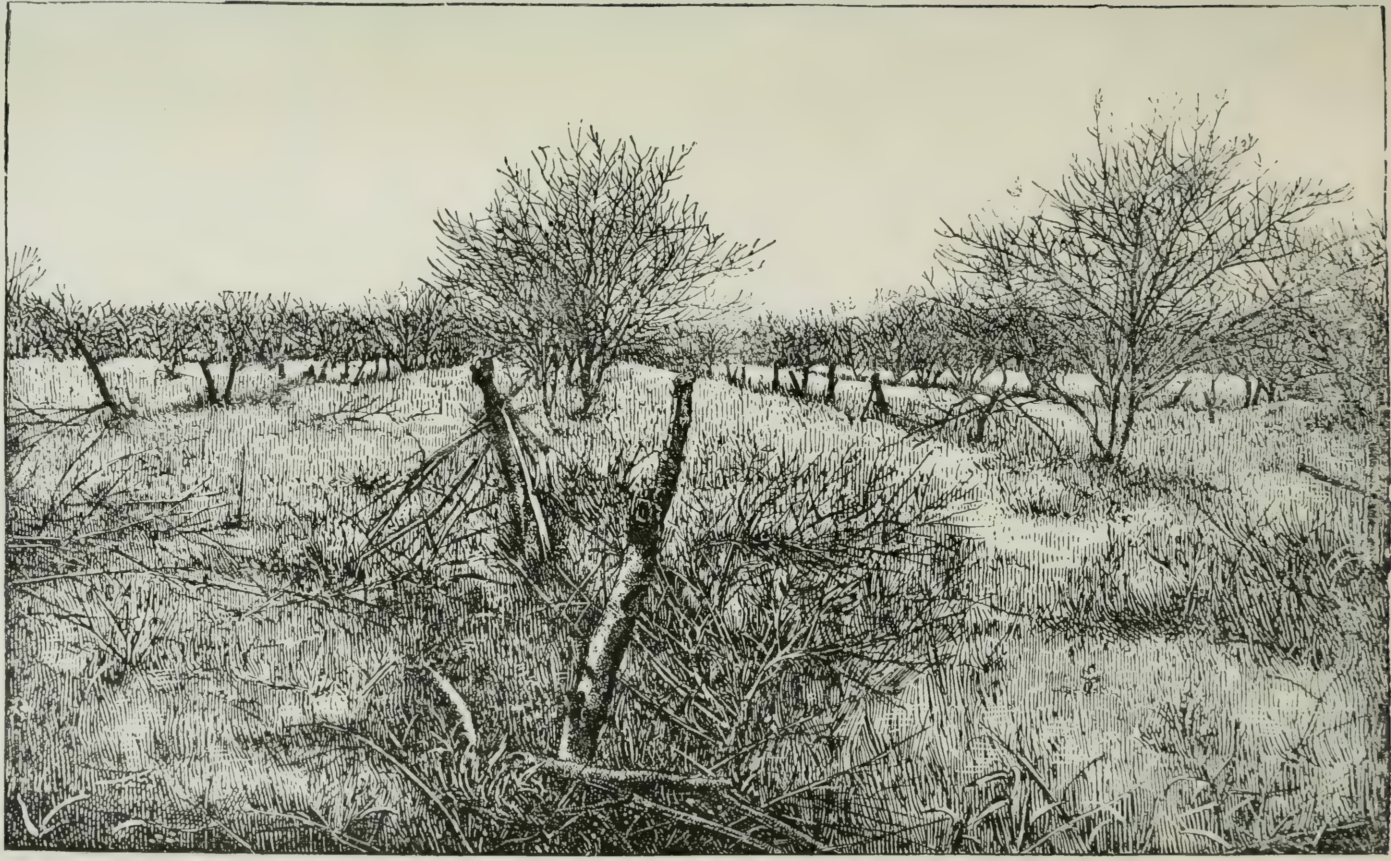


3—Characteristic work of the cigar-case bearer caterpillars on the leaves; natural size.

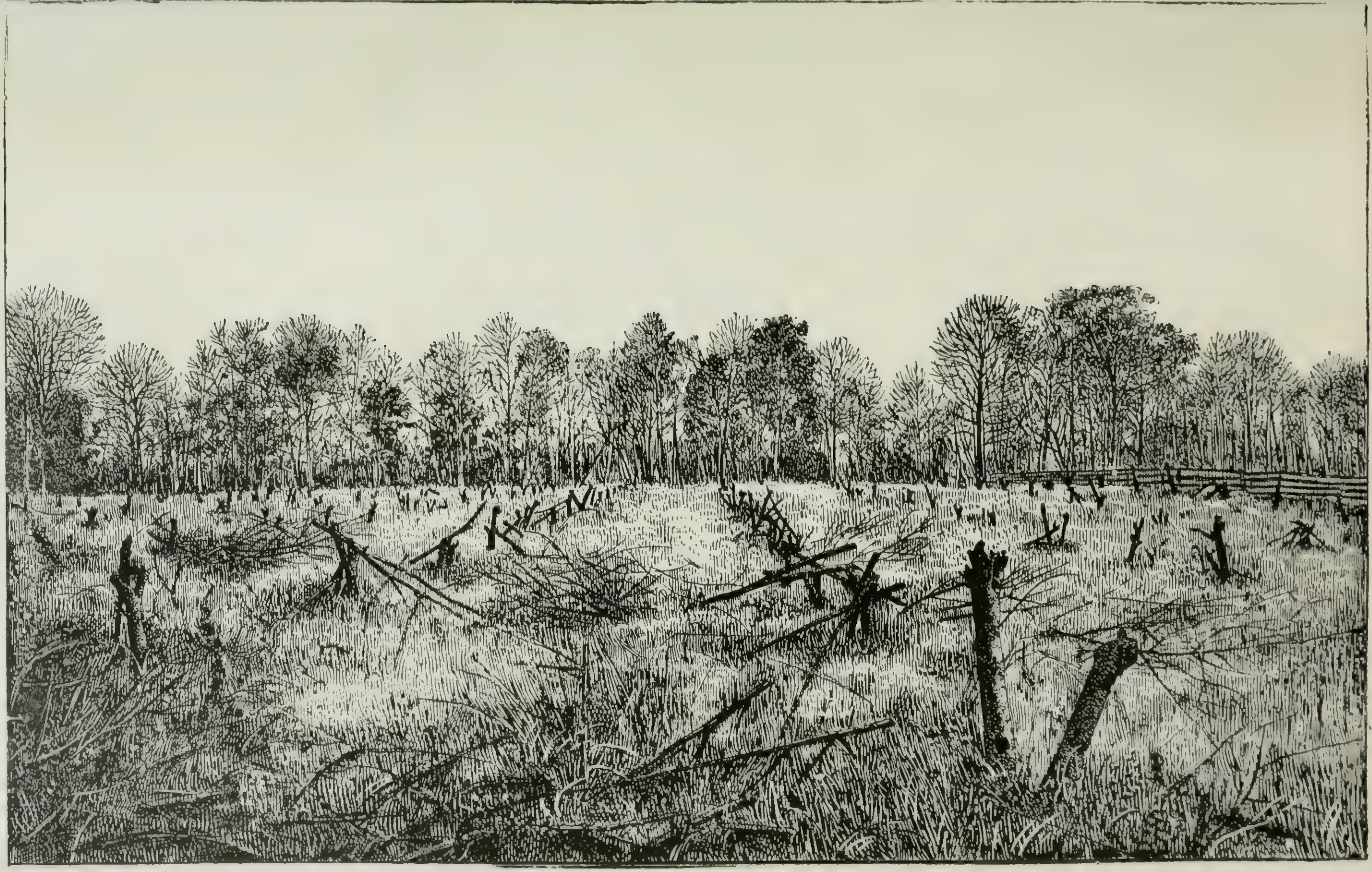
INSECT PESTS



CUTTING AND BURNING WOODS INFESTED WITH THE GYPSY MOTH.
From a photograph taken by the State Board of Agriculture of Massachusetts, in Woburn, in December, 1895.



SCENE—MARYLAND ORCHARD RUINED BY "PEACH YELLOWS."
Reproduced from a photograph taken by the Division of Vegetable Pathology of the Department of Agriculture, Washington, D. C.



SCENE—MARYLAND ORCHARD RUINED BY "PEACH YELLOWS."

Reproduced from a photograph taken by the Division of Vegetable Pathology of the Department of Agriculture, Washington, D. C.

VIII.

INJURIOUS INSECT PESTS FOUND ON TREES AND PLANTS FROM FOREIGN COUNTRIES.

By Alexander Craw, Entomologist and Quarantine Officer of this Board.

The following descriptions are of insect pests found on trees and plants from foreign countries. To every reader of this report the great necessity of a most rigid inspection to keep them out will be apparent. Should they become established in our State, no one can foretell the misfortune that would be sure to follow:

WHITE-POINTED ASPIDIOTUS.

Aspidiotus albopunctatus, Cockerell.

(Plate VIII, Fig. 9.)

New scale found on orange trees from Japan.

"Male scale is very small, hardly over ½ mm., broad, circular, becoming at length elongate by the production of one side, and then over 1 mm. long, slightly convex, dull black, inclining to grayish; exuviæ marked by a white dot surrounded by a black ring. Removed from the bark, the scale leaves a white patch without any dark ring.

"Female scale circular, flat, extremely inconspicuous, dull pale ocherous, more or less blackish; on examining the scale from beneath it is seen that the exuviæ are large and orange. Probably the few female scales seen are not quite adult. Their diameter is about 1 mm.

"Adult Female.—Pale yellow, of ordinary circular shape; pygidial area striated, no groups of ventral glands. Two pairs of lobes only; median lobes large, close together, but not touching, rounded, notched on the outer side and sometimes slightly on the inner; second lobes much smaller, strongly notched on the outer side. Plates spine-like, not very large. Beyond the lobes the margin appears to present three or four irregular serrations, which in well-developed specimens take the form of double spine-like plates. There are two pairs of sac-like incisions, as in *perniciosus*."

This scale closely resembles *Aspidiotus perniciosus*, Comstock, but the male scales of the latter have the exuviæ more or less yellowish. The fact that *perniciosus* does not attack citrus trees, and this species was found plentifully upon the stems and branches of seedling orange trees (*trifoliata*) from Japan, convinced me that it was a new species, so I submitted it to Professor Cockerell, and he pronounced it so, and named it as above. The trees were destroyed.

DUPLEX SCALE.

Aspidiotus duplex, Cockerell.

(Plate VIII, Fig. 11.)

This is a Japanese scale, and appears to be a general feeder. I have found it upon the following trees and plants: Orange, camellia, azalea, *Olea fragrans*, tea, camphor, peony, *Myrica rubra*, and rhododendron.

The female scale is about 2⅔ mm. diameter, subcircular, moderately convex, dark blackish-brown, with the large round exuviæ nearly to one side, and orange in color. Removed from the bark a white patch is left. When upon the stems and larger twigs of the camellia the scale has the same brown color of the bark and is difficult to detect. This scale succumbs readily to fumigation with hydrocyanic acid gas. It locates upon the leaves, twigs, and fruit of the orange.

Description of the Female.—"Pale orange, broadly oval or subcircular, with the large cephalic portion separated from the rest by a deep suture. Mouth parts large; skin on dorsum very strongly, transversely grooved, the grooves linear, often anastomosing. Four groups of ventral glands in the usual situation; caudolaterals of 28 to 30, cephalaterals of 42; median group represented by two orifices, not very close to each other. Besides these groups there is a group of 17 to 22 orifices, quite similar in character, on each side of the mouth parts; these groups are oval in outline. The anus is about on a level with the anterior ends of the caudolateral groups. There are four (two on each side) long tubes or ducts originating about the region between the caudolateral groups and the anus, and passing hindward, practically parallel, to the end of the body. On the dorsal surfaces the segments are marked by rows of oval pores. The 'pygidium' shows on the dorsal surface a very distinct lattice-work, as in *A. theæ* and *Ischnaspis filiformis.* Median lobes very large, brown, rounded at the ends, but notched on each side so as to be trilobed; the lateral lobes very small and passing into the straight parallel sides. The median lobes are very close together, but distinctly separated, not touching, not diverging. There are three other pairs of lobes, small, narrow, rounded at ends, very inconspicuous and easily overlooked among the scale-like plates. Plates not extending beyond lobes, scale-like, not separately distinguishable, but forming a continuous fringe, which rapidly narrows beyond the fourth lobe, and ceases before the deep notch which indicates another segment. Margin cephalad of fourth lobe distinctly serrate, serrations coarse."

FLORIDA RED SCALE.

Aspidiotus ficus, Ashmead.

(Plate VIII, Fig. 2.)

This is a widely distributed species of scale, but so far it has not yet been found in the orchards of this State. The following kinds of trees and plants infested with this destructive pest have been received: Citrus trees from Florida and China; palms from Cuba; *Ilex latifolia* and *Aspidistra lurida* from Japan. It is reported to occur at Khandallah, India, upon orange, also upon various plants in New South Wales, Australia. It has also been found on orange, and on the stems of rose bushes at Vera Cruz, Mexico.

Prof. C. H. Tyler Townsend, in his report of his trip to investigate insects of economic importance in Mexico, for the Division of Entomology, Washington, D. C., says of this species: "Very bad on fruit and leaves of orange in plaza in Tampico; also very bad on tangerine orange in Tampico. Also bad on orange in Matamoras and Chihuahua on leaves of a tree called 'palo dulce.'"

"The scale of the female is circular, with exuviæ nearly central; the position of the first skin is indicated by a nipple-like prominence which, in fresh specimens, is white. The part of the scale covering the second skin is light reddish-brown. The remainder of the scale is much darker, varying from a dark reddish-brown to black, excepting the thin part of the margin, which is gray. When full grown the scale measures 2 mm. in diameter."

ROSS' ASPIDIOTUS.

Aspidiotus rossii, Maskell.

(Plate VIII, Fig. 4.)

This scale closely resembles *Aspidiotus ficus*, but is coal black in color and much larger. It is occasionally found upon such plants as palms, acacias, and *Araucaria bidwillii* received from Australia, also on palms from Samoa. So far it has not been found upon citrus or other fruit trees, but without doubt it will attack the orange and lemon; besides injuring the growth of the trees would also, from its color, destroy the market value and appearance of the fruit. As seen with the naked eye it appears to be jet black, but upon examination with a good lens the exuviæ show two faint brown rings in the adult female; the half-grown scale appears to have but one. The exuviæ are slightly to one side of the center. The male scale is oblong and smaller. In the illustration the scale is lighter, and the exuviæ more conspicuous than in the natural state.

Aspidiotus sphærioides, Cockerell.

(Plate VIII, Fig. 6.)

This scale is from Louisiana, infesting ornamental plants having long *cordylina*-like leaves. The female scale resembles *A. ficus*, but is smaller and more convex; the exuviæ are nearly central. It adheres very firmly to the leaves.

The genus *Aspidiotus* are generally indiscriminate feeders, and should this one attack fruit trees it would probably prove a serious pest, as it is very prolific.

Aspidiotus sp.

(Plate VIII, Fig. 13.)

A large brown *Aspidiotus* found upon ornamental plants from Ensenada, Mexico. They collect in clusters like *Aspidiotus rapax*, but are larger.

Chionaspis aspidistræ, Signoret.

(Plate VII, Fig. 14.)

The female of this species is a small brown scale occasionally found upon *Aspidistra lurida*, from Japan. The white carinated males predominate, and are very conspicuous.

Chionaspis assimilis, Maskell.

(Plate VIII, Fig. 3.)

This is an Australian species attacking a species of eucalyptus or acacia.

"Female scale elongated, pyriform, slightly curved; color, dark brown; the pellicles at one end yellow; length, about $\frac{1}{10}$ inch.

"Male scale brownish-white, narrow, semi-cylindrical; pellicle yellow; length, $\frac{1}{16}$ inch.

"Adult female, of the usual elongate form of the genus, the cephalic region smooth, the abdomen with conspicuous segments; color, brown; length, about $\frac{1}{15}$ inch. The abdomen ends in two median lobes, with at each side a few spines; pygidium exhibiting five groups of spinnerets, but only two or three in each group.

"The larva is of the normal form of the Diaspid group, but the rostrum appears to be abnormally large."

MINING SCALE.

Chionaspis biclavis, Comstock.

A. On Orange.—(Plate VII, Fig. 5; also Plate VIII, Figs. 7 and 8.)

Specimen twig taken from a cargo of 325,000 orange trees that arrived at San Pedro from Tahiti on June 15, 1891. The trees were fumigated five times, with double and treble strength hydrocyanic acid gas, and dipped twice in a strong caustic solution, with the result that the trees were injured, but sufficient scales survived to justify legal proceedings being instituted against the trees as a nuisance. After two lengthy trials the court decided against the importers, and the trees were burned.

Professor Comstock described this species in 1883. One of his illustrations represents the scale upon a fig leaf, and clearly shows its mining habits, the dermal layer of the leaf with its hairs being continuous over the surface of the scale. The scales upon the orange trees from Tahiti were located under the outer skin or epidermis, and the marking or faint stripes of the bark were well defined over the scale; the latter would be difficult to detect were it not for the swelling where located upon the stem or branch. The following is Professor Comstock's description:

"The scale of the female is very nearly circular; the exuviæ are marginal, and project beyond the edge of the scale.

"*Female.*—The characters presented by the last segment of the female are as unusual as those presented by the scale. The pores on the dorsal surface of the segment are very small. Scattered over the ventral surface are numerous minute spines. The groups of spinnerets are wanting. The mesal lobes are large, oblique, nearly twice as broad as long; approximate at the base; the mesal margins diverge slightly, destal margin serrate; mesa destal angle rounded and produced into a lobule. The second lobe is very small, being simply an angular projection of the body wall. The third lobe is about three times as wide as the second lobe; but it projects only a little beyond the margin of the segment. The plates are simple and spine-like. There are two minute ones between lobes; two between first and second lobes; two or three between second and third lobes; a group of three or four larger ones laterad of third lobe; and another group of four or five still larger ones about midway between this group and the penultimate segment. Each of the three segments preceding the last bears on each lateral margin about seven plates.

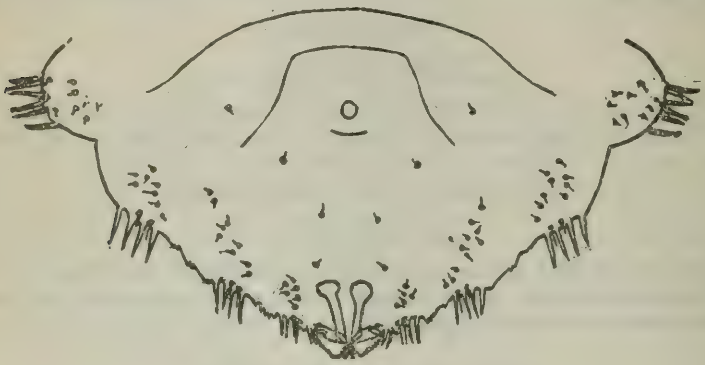


Fig. 2.

"Two spines accompany each group of plates, one on the dorsal surface and one on the ventral. The first and second spines of each side are very small; the third, which is between the second and third lobes, is the largest; the fourth and fifth are successively smaller.

"There are two conspicuous club-shaped organs which appear like thickenings of the body wall, but which are really within the body cephalad of the mesal lobes. These organs are about three times the length of the mesal lobes; they converge caudad, and the cephalic end of each is suddenly enlarged. This species may be distinguished from any other known American coccid by the presence of these organs."

Fig. 2 (after Comstock) represents the last segment of the female, as seen under the microscope, showing the *club-shaped organs* peculiar to this species.

On September 22, 1896, the American barkentine "Tropic Bird" arrived from Tahiti. A passenger brought six coffee trees infested with the "mining scale." The scales were under the thin outer bark, but even in such an apparently secure location a very large percentage of the scales were destroyed by an internal chalcid parasite. There were no indications of parasites having attacked any of the scales infesting the orange trees that arrived from the same place in 1891.

B. ON GUAVA.—(Plate VIII, Fig. 7, Guava; Fig. 8, Gardenia; Plate VII, Fig. 5, Orange.)

On January 16, 1896, the steamship "Willamette Valley" arrived from Mexican ports. A lady passenger had ten Mexican guava plants that were infested with this serious scale pest, so they were destroyed. Citrus trees from Tahiti and southern Mexico, also gardenias and guavas from three districts in the latter country, would indicate that this scale is becoming widely distributed and is not confined to one food plant; therefore, the danger of its introduction is great.

Mr. Maskell records a new variety (*C. detecta*, Maskell) of this species, found upon shade trees in the Sandwich Islands. The difference between this and Professor Comstock's species consists only in the fact that the Sandwich Islands scale does not burrow, but lies exposed on the bark. This is very poor ground upon which to erect even a variety. The name of the tree upon which it was found is not given; the probability is, however, that the outer bark or epidermis was of such a character as to prevent the mining habits of this species.

On May 3, 1896, a passenger from Soconusco, Mexico, per the steamship "Colon," brought three cuttings of gardenia. They were found to be infested with the "mining scale." A cabinet specimen was saved, and the others were destroyed. The passenger stated that his gardenia bushes, which formerly were vigorous and profuse bloomers, were now dying, and he could not account for it.

CHINESE CHIONASPIS.

Chionaspis chinensis, Cockerell.

(Plate VII, Fig. 3.)

This is a new species of scale found upon some *Quercus* that arrived from China, May 20, 1896. The trees were destroyed. The following is Prof. Theo. D. A. Cockerell's technical description, to whom I referred the species:

"*Female Scale.*—2⅔ mm. long, 1⅔ broad, snow-white, broad, flat; exuviæ clear orange, second skin ⅔ mm. long.

"*Female.*—Median lobes brownish, wide apart, even at the base, diverging, low, little produced, the long inner margin crenate. Second and third lobes each represented by a pair of rounded lobules, of which the mesad is the larger. Between the lobes are long spine-likes plates. Mesad of each lobule, at its base, is a very short saccular gland. A pair of these glands marks the place of the fourth lobe, which, however, is entirely obsolete, leaving the margin slightly crenate at that place. Cephalad of this is on the margin a spine, and further on a large spine-like plate, and still further a group of four large spine-like plates. The obsolete segments are marked by conspicuous rows of transversely elongate glands. Five groups of ventral glands, the lateral groups nearly touching. Median group of 9, cephalaterals 17, caudolaterals about 25. Lateral margins of segments rounded, not much produced.

Male Scale.—Small, ordinary, white, with no distinct keel; not fluffy; exuviæ orange."

"Allied to *C. nyssæ*, and especially to *C. eugeniæ*. The species *nyssæ*, *chinensis*, and *eugeniæ*, though so widely separated geographically, form a natural group of the genus."

ORANGE CHIONASPIS.

Chionaspis citri, Comstock.

(Plate VII, Fig. 11.)

This injurious scale has been found upon orange trees from Australia, and upon other plants from Japan and the South Sea Islands. The male scales are light colored and very conspicuous.

"The female is a dirty dark brown with a gray margin. The exuviæ are brownish-yellow. There is a central ridge from which the sides of the scale slope like the roof of a house. The greater prominence of this ridge and the more elongated form of the scale, are the principal differences between this scale and that of the females of *Chionaspis euonymi.*"

So far this scale has not been reported as having been found established in this State.

NEW SCALE INSECT.

Chionaspis difficilis, Cockerell.

(Plate VII, Fig. 8.)

This scale was found upon nursery stock (Eleagnus) imported into San Francisco from Japan, and destroyed.

"The female scale about 2 mm. long, irregular, from round to subelongate, slightly woolly in texture, white, moderately convex; exuviæ to one side, rather inconspicuous; second skin black or nearly so; first skin pale straw color, about one-third on second, but on the side toward the middle of the scales sometimes the exuviæ are reddish. Removed from the twig this scale leaves a very conspicuous snow-white patch.

"The male scale is white, tricarinate, exuviæ almost colorless.

"Adult female when removed from the scale is plump, orange rufous, with a slight purple tinge.

"The female scale differs from *amygdali* in the color of the exuviæ, and the male scale is quite distinct, being well tricarinate."

EUONYMUS SCALE.

Chionaspis euonymi, Comstock.

(Plate VII, Fig. 9.)

A shipment of *Euonymus latifolius argenteus variegatus* from Japan was so seriously infested with this pest that on portions of the stems and twigs the bark was invisible. The leaves appear to be a favorite location for the narrow, white, carinated male scales. This species very closely resembles the "orange Chionaspis" (Plate VII, Fig. 11). It is also occasionally found upon the golden variegated euonymus. This scale was found on euonymus at Norfolk, Va., but it is probably a Japanese species, as the above varieties of *euonymi* are natives of Japan.

ALMOND SCALE.

Diaspis amygdali, Cockerell.

(Plate VIII, Fig. 12, walnut; Plate VII, Fig. 2, plum.)

This scale very closely resembles the destructive *Diaspis lanatus*, and is as much to be feared. Great quantities of plum, persimmon, peach, cherry, and walnut trees infested with this scale have been received from Japan, and destroyed.

Japanese-grown trees infested with this scale have also been received in San Francisco that came by way of Seattle, Washington, and via Sydney, Australia. There is no question about the origin of the last-mentioned lot, as the Japanese graft more clumsily, using larger stocks and a different method to nurserymen in other countries.

The female scale is not very conspicuous, of a dirty gray, with a reddish-brown exuviæ to one side. When the scale is removed from the branch it leaves a white ventral scale attached to the bark.

Plum trees were received that had the stems under the surface of the ground, and some of the surface roots slightly infested with this scale, resembling in this respect the "rose scale" (*Aulacaspis rosæ*).

A NEW PEACH, CHERRY, AND PLUM SCALE.

Diaspis lanatus, Morgan & Cockerell.

(Plate VIII, Fig. 1.)

This scale has been found upon cherry, peach, and plum trees from Japan.

Experiments conducted by the entomological department at Washington, D. C., with the strongest and best known insecticides, demonstrated the fact that this is one of the most difficult to kill, as well as one of the most pernicious scales known.

Prof. L. O. Howard mentions the following places and varieties of plants upon which it is found: "In the District of Columbia it is found only upon peach. In Florida and Georgia it has been found upon peach and plum. In Ceylon it occurs upon geranium; in Jamaica upon grape, bastard cedar (*Guazuma ulmifolia*), *Cycas media*, *Capsicum*, *Argyreia speciosa*, the bark and twigs of an undetermined malvaceous plant, *Bryophyllum calycinum*, peach, pelargonium, jasminum, stems of cotton, *Colotropis procera*, and *Hibiscus esculentus*."

"The scale of the adult female is gray in color, and is not readily distinguished. It occurs abundantly upon larger twigs than is customary with other scale insects, and frequently appears to be almost covered by the outer bark of the twig. The males have a white scale, as a rule, cluster on the lower parts of the branches of young trees and at the base of the trunk. Where the insect is abundant, the trees frequently appear as if whitewashed, from the masses of these male scales."

Diaspis patelliformis? Sasak.

(Plate VII, Fig. 1.)

This scale is from Honolulu, and resembles the rose scale (*Aulacaspis rosæ*).

CAMELLIA FIORINIA.

Fiorinia camelliæ, Comstock.

(Plate VII, Fig. 6.)

This is a very widely distributed species, and is a very serious scale upon palm trees and camellias; the leaves become yellow and wither up or drop. It has been found on plants from Belgium, Australia, Sandwich Islands, Japan, and the Eastern States; it also infests cocoanut palms in Jamaica. Frequently it is found in hothouses in this State. It is a very inconspicuous species.

The scale of the female is yellowish-brown, with the larval skin yellow, and a thin margin of the remainder of the scale white. That part of the scale which covers the second skin has a prominent longitudinal, central ridge, which is dark brown; the sides of the scale sloping from the ridge are more or less wrinkled. The full-grown female removed from the scale is a pale yellowish-brown color, with large irregular lemon-yellow spots. The scale of the male is similar to that of the female, but smaller.

THREAD-LIKE SCALE.

Ischnaspis filiformis, Douglass.

(Plate VII, Fig. 4.)

This is a long, narrow, black scale, resembling closely a *Mytilaspis*, found upon a variegated *Pandanus* from Japan. It is reported as occurring in extraordinary numbers on *Cycas revoluta* at Trinidad, West Indies. It was received at Wellington, New Zealand, from Adelaide, South Australia, where they were plentiful upon palms in hothouses.

KEELED MYTILASPIS.

Mytilaspis carinata, Cockerell.

(Plate VII, Fig. 12.)

This is a new species, found upon wide-leaved plants from Acapulco. It slightly resembles the purple scale (*M. citricola*), but differs in having a narrower and distinctly carinated scale.

"Female scale, 3¼ mm. long; second skin about 1 mm., first skin about ½ mm., about one half on first; width of scale, ¾ mm. Scale pale brown (in dry specimens they become very dark), strongly keeled, almost exactly straight. Narrow, not shining; exuviæ dull orange. Male scale similar but smaller, with only one pellicle."

PURPLE SCALE.

Mytilaspis citricola, Packard.

(Plate VII, Fig. 7.)

This destructive scale is very widely distributed, for the specimen shown on plate was taken from lime trees brought from Guatemala, and destroyed. It is found in the orange and lemon districts of Europe, the West Indies, Florida, and Tahiti. It was noticed this year for the first time from Central America. This scale was unfortunately introduced upon orange trees from Florida that were planted a few years ago without fumigation, and it has got a very strong foothold in San Diego County, where all means should be employed to eradicate it.

NEW MYTILASPIS.

Mytilaspis crawii, Cockerell.

(Plate VII, Fig. 13.)

This is a new scale, and one of the smallest of this destructive family of scale insects. Its mining habits and size make it extremely difficult to detect. It lives beneath the epidermis, on the underside of the leaf of *Quercus cuspidatus*, and a species of Eleagnus from Japan.

"The female scale is narrow, measures 2⅓ mm. long and ½ mm. wide; pale orange yellow; exuviæ concolorous.

"Adult female yellow, four groups of ventral glands, caudolaterals of 3, cephalaterals of 4 in a row. Median lobes very large, roundish at the ends, their edges finely serrate. They are closely adjacent at a point at the base, being separated, however, by a pair of small spine-like plates; thence they diverge at nearly a right angle to their rounded ends; thence rapidly sloping, the outward slope longer than the inner, and diverging from it at an angle of about 80°. Next to the outer side of each median lobe is a small spine-like plate, then a sac-like incision, then the small second lobe, shaped much like the last joint of a finger, and in bulk hardly one tenth of a median lobe. Following this is a small sac-like incision, then a pointed projection, then two succular incisions, then after a short interval a spine-like plate, then another sac-like incision, then a long interval of smooth margin, then another sac, then another interval, in the middle of which is a small spine. Below the sac-like incisions are transversely elongate pores."

"The scale is extremely inconspicuous, as it lives beneath the epidermis, on the under side of the leaf, along the mid-rib. By this habit, and the large median lobes, it will be readily distinguished. From *M. grandilobus*, Maskell, which has the large median lobes, it is known by the entirely different color of the scale, etc. Several of the specimens were parasitized."

LONG SCALE.

Mytilaspis gloverii, Packard.

(Plate VIII, Fig. 14.)

This is the destructive scale of the orange, and was found upon some deciduous ornamental plants from Japan. Citrus trees from the same country are also occasionally found infested with the same scale, also ornamental plants from the Sandwich Islands, and orange and lime trees and palms (*Pritchardia filimentosa*) from Baja California, Mexico.

This scale was also unfortunately brought from Florida upon orange trees shipped into San Diego County, right in the heart of the best lemon district. The trees arrived at the same time as those referred to on page 95 of the Fourth Biennial Report of this Board. No expense should be spared in stamping this pest out of the State.

PERGANDE'S CHAFF SCALE.

Parlatoria pergandei, Comstock.

(Plate VIII, Fig. 5.)

Citrus trees from Florida were frequently found infested with this inconspicuous scale, but it succumbs readily to fumigation with hydrocyanic acid gas.

Thousands of orange trees from Florida have been planted in the southern and central counties, but were thoroughly gased before they were set out, and so far it has not been reported as occurring in the State. This scale is quite common in Florida, and decidedly more difficult to kill with washes than either the "purple" or "long." Hydrocyanic acid gas is used effectively in destroying this scale.

When located upon the gray bark of orange trees it resembles the bark, but is more conspicuous upon the leaves. The female scale is light-colored, nearly circular, with the exuviæ at the edge, giving it a slightly pointed appearance. The male scale is white with a darker larval skin, very small and narrow.

NEW SCALE.

Parlatoria theæ, var. *viridis*, Cockerell.

(Plate VII, Fig. 10.)

This scale was found upon ornamental plants from Japan.

> "The female scale is about 1½ mm. long, nearly circular, but the exuviæ projecting at one side give it a broad, pyriform outline. From one third to two thirds of the first skin overlaps the second. First skin, dark green to greenish-black. Second skin, about twice as long as first, nearly round, dark greenish to black, with sometimes a narrow brown margin. Scale very little convex, white, with a more or less pronounced grayish-yellow tinge. Removed from the bark it leaves a white mark."

In regard to this scale, Professor Cockerell says:

> "The species of *Parlatoria* are not easy to define, and I really do not know whether, in the present case, we have to do with a valid species or a variety of *theæ;* at any rate, *viridis* may be known by the more produced tips of the median lobes, the median plates as long as those between the first and second lobes, the bright green color, the five groups of ventral glands, and the pale flattened scale. In *viridis*, the lateral groups of glands almost or quite touch each other, while in *theæ* they are well apart. From Maskell's species, *myrtus* and *pittospori*, *viridis* differs at once by the plates being not longer than the lobes. From Del Guercio's *P. targionii* it differs by the dark exuviæ, and other characters. Nor will it agree with the other species, *pergandei*, *protus*, *zizyphus*, and *victrix*."

DATE PALM SCALE.

Parlatoria victrix, Cockerell.

(Plate VII, Fig. 15.)

This scale was introduced upon some date palms received by the Department of Agriculture, Washington, D. C., from Cairo, Egypt, in 1890, and later distributed to Phœnix (Ariz.) Experiment Station and the Tulare and Chino Experiment Stations in this State. The palms were treated with sprays, but enough scales escaped, as it is impossible to reach all by this method of disinfection. The trees at Phœnix were again treated by spraying, under the direction of Prof. J. W. Toumey, with a strong solution of kerosene emulsion, but this was not effective in exterminating the scale. The plants were afterward taken up and treated with a wash of one and a half pounds of whale-oil soap to each gallon of water. No live scales were found after this treatment.

Specimens received from the Chino Station showed live old and young scales. The trees were subsequently treated twice with hydrocyanic acid gas under a tent.

An inspection of the Tulare trees was made and they were found to be free from pests of any kind.

The female scale resembles *P. zizyphi*, but the large second skin, instead of being all black, is broadly margined with pale straw color. With the exception of the exuviæ, the balance of the scale is white.

The male scales are smaller than the female, white, with light yellowish exuviæ.

OLIVE SCALE.

Pollinia costæ, Targ-Toz.

(Plate VIII, Fig. 10.)

In 1887 a few olive trees were received at Pasadena, Los Angeles County, direct from Italy. In 1893 the trees were found to be very seriously infested with this small but destructive scale. A good idea of the manner in which it attacks the branches and twigs is given in the illustration. The trees were stunted, with scant foliage, having made very little growth the two years previous. The trees were destroyed and a thorough inspection of all olive trees in that district was made, but no more could be found. The scale has no particular form, but cluster over each other in dirty white masses.

FRINGED SCALE.

Planchonia (*Asterolecanium*) *fimbriata*, Fonscolombe.

(Plate VI, Fig. 2.)

This interesting scale was found upon climbing plants from Mexico, presumably from Mazatlan. The waxy test and fringe of this scale resembles *Asterolecanium pustulans*, Cockerell.

NEW SCALE.

Planchonia (*Asterolecanium*) *pustulans*, Cockerell.

(Plate VI, Fig. 11.)

This is a very interesting species. In the adult female it has a greenish test with a fringe of pinkish glassy tubes; in this it resembles *Planchonia fimbriata*.

This scale is occasionally found upon oleander from Honolulu. From the condition of the infested branches it is a very injurious species. Where each scale locates a depression is made in the bark, giving it a rough, scaly appearance.

OAK SCALE.

Planchonia (*Asterolecanium*) *quericola*, Bouche.

(Plate VI, Fig. 15.)

A specimen of this scale was received from Niles, Alameda County, April 10, 1896.* It was found upon Golden oak trees received from Rochester, N. Y. This is the first time this scale has been found in this State. The destruction of the trees was advised. Some of the twigs were completely encased by the scales. The adult female somewhat resembles a small *Lecanium;* it has two distinct colors; half of the scale transversely is lemon or yellowish, and the other half a dark olive green; around the edge of the scale is a short, double fringe of glassy tubes, the latter only observable by the aid of a good lens or microscope. It is a European species and said to have been very destructive to oak trees near Paris in 1836. It is also reported as occurring upon some oak trees at Nelson, New Zealand, where it is reported to be damaging the trees.

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*Discovered by Mr. Wm. Barry, County Horticultural Commissioner of Alameda County.

INDIAN WHITE WAX SCALE.

Ceroplastes ceriferus, Anderson.

(Plate VI, Figs. 5 and 12.)

This a very conspicuous scale found upon camellia, gardenia, and orange plants and trees, received from Japan. It has also been found in Australia upon *Melaleuca hypericifolia* and *Myrica cerifera*, and in India upon *Celastrus ceriferus*, and on the Assam tea plant. This species was first mentioned by Dr. Anderson in 1790–91, and fully described by Mr. Maskell in his coccid notes, page 216, of the "Transactions of the New Zealand Institute," 1892. It reads:

"Test of adult female white or yellowish-white, waxy, convex, thick; frequently agglomerated in large masses covering the twigs of the food-plant [as shown in Fig. 12]. Separate individuals may range in size from $\frac{1}{5}$ to $\frac{1}{2}$ inch. Marginal tuberosities not distinguishable, though the margin is sometimes slightly flattened and irregular. The apex of the test is sometimes produced in a short pointed horn, not erect but bent over the test. The wax is rather soft and greasy. Test of the second stage slightly convex, elliptical; color grayish-white. Median dorsal region usually smooth, separated by a narrow depression from the marginal region, which exhibits eight tuberosities, three on each side and two terminal. Average length of test about $\frac{1}{7}$ inch.

"Adult female brown, very convex, elliptical, hollow beneath. Form lecanid but the anal cleft and lobes are not easily made out, being contained in a conspicuous cylindrical 'tail' or prolongation of the abdomen. Antennæ of six joints, of which the third is much the longest. Feet rather thick, but not at all atrophied; tibia scarcely longer than the tarsus; upper or tarsal digitules slender knobbed hairs, lower pair on the claw rather long, thick, and expanded at the end. Rostrum rather large; mentum doubtfully dimerous. Near the spiracles, on each margin, is a group containing eight large conical spines and about twenty-four smaller ones. Epidermis bearing many circular spinneret-orifices. When the 'tail' is subjected to the action of potash and subsequent pressure it is seen to contain at its extremity the abdominal lobes and the anogenital ring, which has six rather strong hairs.

"Female of the second stage brown, elliptical, slightly convex. Form lecanid, exhibiting the normal cleft and lobes; there is no 'tail,' but the region surrounding the lobes is thickened. Antennæ and feet as in the adult, but the feet are more slender. The margin bears a row of very fine spiny hairs, and four spiracular groups of large conical spines. There are many small circular spinnerets on the epidermis.

"Larva yellow, elliptical flattish; length about $\frac{1}{70}$ inch. Form normally lecanid, the anal lobes bearing long setæ. Antennæ thick, with six rather confused joints. Male unknown."

RED WAX SCALE.

Ceroplastes rubens, Maskell.

(Plate VI, Figs. 3 and 4.)

This is occasionally found upon trees and plants received from Honolulu. The plants most frequently infested are ferns. This is probably because they are grown under trees for the necessary shade. Alligator pear and orange trees are also subject to their attacks. The illustration is a leaf of an alligator pear, and shows the manner in which they are most frequently found on the foliage; they also attack the twigs.

This scale has become a very serious pest on the Sandwich Islands. It is probably a native of India. Mr. Maskell reports it upon mango and *Ficus macrophylla*, collected by Mr. Koebele at Brisbane, Australia.

"Test of the adult female waxy, rather thick, dull red or pinkish throughout; form, subcircular, quite flat beneath, with an orifice for attachment to the plant, the upper surface with irregular sloping sides and flattish top, in the center of which there is sometimes a minute, indistinct orifice; from the orifice very distinct lines may be made out in some specimens, radiating to the margin; and the lateral irregularities may sometimes be resolved into seven or eight indistinct tuberosities. Diameter of test variable; specimens observed range from $\frac{1}{11}$ to $\frac{1}{4}$ inch.

"The test of the second stage appears to be similar to that of the adult, but smaller; it is very difficult to make out the lateral tuberosities, which sometimes seem to be only five.

"Test of the larva in its latest period before the first metamorphosis whitish, waxy, stelliform, having usually eight lateral radiating processes, and a dorsal convex mass of wax; average length of the whole, about $\frac{1}{40}$ inch.

"Adult female extracted from the test yellowish-brown or dark brown; subcircular, convex above and concave beneath; form, normally lecanid; anal cleft small, lobes triangular, each bearing a short seta; anal ring with six strong hairs. At the cephalic extremity there is a dorsal elevation or tuberosity, which bears several small subconical papillæ. Antennæ of six joints, of which the third is much the longest. Feet nearly atrophied, short, thick; tarsus very short, claw small, digitules slender knobbed hairs. Rostrum rather large; mentum monomerous. On the margin near the four spiracles is on each side a patch containing one large, thick conical spine and about twenty other smaller ones. Dorsal epidermis bearing some small circular spinneret-orifices.

"Larva dark yellow, flattish, elongated, distinctly lecanid. Eyes large, brown. Antennæ of apparently six joints, but the fourth and fifth are not easily separable. Length of insect in this stage about $\frac{1}{80}$ inch at first, increasing to about $\frac{1}{50}$ inch with age. Male unknown."

In a case of spice and other economic plants received in San Francisco from Singapore, India, were a few cinnamon plants that were infested with a wax scale that is undoubtedly *C. rubens*, although the scales were smaller and differed slightly in color. (Plate VI, Fig. 3.)

NEW ARAUCARIA SCALE.

Dactylopius aurilanatus, Maskell.

(Plate VI, Fig. 13.)

Found upon *Araucaria bidwillii* from Australia. Mr. Maskell reports it upon *Araucaria excelsa* and other conifers in New Zealand, where it smothers the plants and soon renders them unsightly; he thinks that in a warm climate it would spread rapidly, as the eggs are very numerous and the larvæ very active.

"Adult female slightly elongated, nearly globulus, of a rich dark purple color, bearing on the dorsum a longitudinal band of bright golden-colored meal, with small patches of similar meal often visible on the edges. In alcohol or potash it produces a rich purple tint, and if crushed in the fingers stains them a dark red. The eggs, which are also purple, are laid in a mass behind the insect in a thin, white cottony web, the mass having thus a general dark gray appearance. Body obscurely segmented, length about $\frac{1}{11}$ inch.

"Antennæ usually of eight joints, often of seven; in the former case the fourth, in the latter the third, joint is the longest, the rest subequal, except the last, which is fusiform, and nearly equal to the longest; all the joints have a few hairs, the last bearing several."

Eriococcus sp.

(Plate VI, Fig. 14.)

This is an Australian species found upon palms. Plants infested with this scale have the same dirty-black fungous growth upon the upper surface of the leaves that characterizes plants or trees attacked by *Lecaniums*.

LONG SOFT SCALE.

Lecanium longulum, Douglass.

(Plate VI, Fig. 7.)

This scale is found upon crotons, *Carica papaya*, palms, ferns, and casuarinas, from the Sandwich Islands. It resembles the "soft brown scale" (*L. hesperidum*), but is longer and narrower. Plants infested with this scale have the same smutty appearance that characterizes plants attacked by other *Lecaniums*.

Mr. Maskell reports this species from Fiji. Professor Cockerell found it in Kingston, Jamaica; also reports having received it from Cheshire, England, upon euphorbia that had been grown under glass. It has not yet been reported in the orchards or orange groves of this State. In the West Indies it is considered a rather serious pest.

NEW BLACK SCALE.

Lecanium nigrum, Nietner.

(Plate VI, Fig. 6.)

A smooth, oval, shiny black scale found upon ferns and other plants from the Sandwich Islands. It has been reported to exist in India and Ceylon, where it attacks coffee. Professor Cockerell says it is seldom found on the coffee, though "sometimes present in large numbers upon the croton-oil plant and the ceara rubber, where it produces the usual effect, viz., a heavy fall of leaf and black fungus."

All plants found infested with this scale have been destroyed.

FLAT BLACK SCALE.

Lecanium perforatum, Newstead; *Lecanium tessellatum*, Signoret.

(Plate VI, Fig. 1.)

This is a flat, dark scale frequently found upon palms from the Sandwich Islands and Australia, also occasionally upon such plants in hothouses. There appears to be some question about the identity of this species. When it was first observed it was mistaken for *L. depressum*, Targ-Toz. Prof. Cockerell says: "While I cannot very well doubt that it is Newstead's *L. perforatum*, I must confess that I am not well satisfied about its distinctness from *tessellatum*."

ORTHEZIA.

Orthezia insignis, Douglass.

(Plate VI, Fig. 9.)

This is a very interesting cottony scale found upon some coleus from the East. The adult females retain their legs and antennæ even when the long, narrow egg-sac is fully developed; in this respect they resemble *Icerya purchasi* and differ from *Pulvinarias*.

This species is reported as abundant upon orange trees in Guadalajara, and upon lime trees in Aguas Calientes, Mexico. Should it obtain a foothold it would probably become a pest in the citrus orchards of this State.

NEW COTTONY SCALE.

Pulvinaria psidii, Maskell.

(Plate VI, Fig. 8.)

The coffee plantations in the Sandwich Islands were threatened with destruction by this pest. Letters received from there would indicate that the planters could see nothing but bankruptcy before them in their coffee business. Since the introduction of the ladybird, *Chryptolæmus montrouzieri*, the scale has been cleaned out, and the coffee bushes are now vigorous and healthy.

The trees and plants upon which this pest have been found and destroyed were ferns, orange, coffee, pomegranates, and alligator pears, from the Sandwich Islands. The scale somewhat resembles *Pulvinaria camellicola*, but the specimens that have been found have shorter and more fluffy egg-sacs. The following is Mr. Maskell's description:

> "Adult female yellow or yellowish-brown, sometimes with a greenish tinge; size variable, reaching $\frac{1}{12}$ inch before the ovisac is formed. but shriveling at gestation. The ovisacs cover the twig or leaf with masses of dirty-white cotton, usually accompanied by black fungus. Antennæ rather long and slender, of eight joints. of which the third is the longest. the eighth next, and the rest shorter and subequal. Feet also rather long; the trochanter is large, and bears a very long hair; tarsus curved, and about half as long as the tibia; upper digitules fine hairs. lower pair long and dilated at the end. Abdominal cleft moderate; anogenital ring, with several hairs. The margin of the body bears a row of spiny hairs.
>
> "Female of the second stage yellow, flattish, elliptical; length about $\frac{1}{20}$ inch. Antennæ of six joints.
>
> "Larva yellow, flat, elliptical. Antennæ of six joints.
>
> "Male unknown."

HONOLULU BEETLE.

Adoretus umbrosus.

(Plate VI, Fig. 10.)

This is a pest that is known in Honolulu as the "Japanese beetle." It works at night and attacks the orange, grape, peach, rose, and other trees and plants in such a way that nothing but the skeletonized leaves are left. They burrow in the soil in the daytime, coming forth after sundown. To guard against its introduction into this State, all fresh soil about plants in boxes from Honolulu is dumped into the bay.

It is a dark brown beetle; the head, thorax, and elytra are thickly covered with very short, light hairs that give it a grayish appearance; it measures about half an inch in length by one quarter of an inch in width.

SIX-SPOTTED MITE.

Tetranychus 6-maculatus, Riley.

This is the mite of the orange that has done so much damage in the citrus groves of Florida since 1886. Considering the enormous quantities of citrus trees that have been brought into California from Florida, it is surprising that it is not found all over the orange-growing sections of the State, as mites withstand disinfection with hydrocyanic acid gas better than other tree pests. It has unfortunately succeeded in obtaining a foothold upon some Florida-grown trees in San Diego and Los Angeles counties, therefore a description of it is given in order that growers may recognize it and take measures to prevent its spread:

> "When full grown they measure 0.3 mm. long, oval in shape, being widest just back of the eyes. The general color is pale greenish-yellow; the abdomen is marked above with six or less small dusky spots, which are arranged in two subdorsal rows of three spots in each. These markings are quite constant, especially in the smaller and more numerous specimens, though somewhat variable in the larger mites. The young mite differs from the adult in size, and being either without markings or in having the middle pair wanting; also in having but three pairs of feet. The eggs, which are loosely attached to the web, are globular, very minute, but large in proportion to the adult mite, and are either colorless or very pale greenish-yellow."

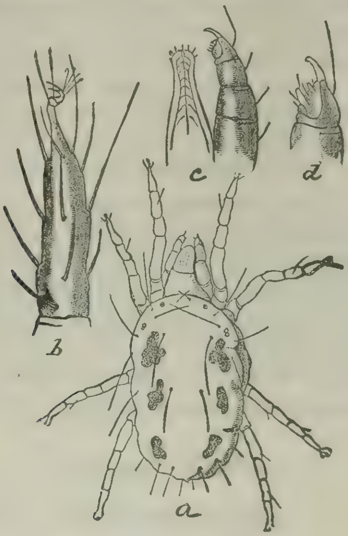

Fig. 3. Six-spotted Mite.*

a, from above, enlarged; *b*, tarsus; *c*, rostrum and palpus, still more enlarged; *d*, tip of palpus, still more enlarged.

An infested tree has a mottled appearance; the mites congregate in colonies on the under side of the leaves, usually producing a concavity, across which they spin their delicate web and feed upon the juices of the tree. The upper surfaces of the leaves are marked with yellow blotches. The dry climate of the State is very favorable for the increase of plant mites, but it is also an advantage in the warfare against them. The most efficacious remedy for such pests is a liberal application of powdered sulphur. This is cheap and can be expeditiously applied with sulphur bellows or the sulphuring machine, as figured on Plate V of the Report of this Board for 1893–94. The best time to apply the sulphur is the early morning when the foliage is damp; then it adheres better, the warm sunshine vaporizing it, a condition is produced unfavorable to their propagation or existence. Heavy rains during the summer are a certain check to them, but of course this cannot be depended upon. In Florida, during the dry season of 1887, they increased enormously, but were partly destroyed by the midsummer rains.

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*We are indebted to Prof. L. O. Howard, U. S. Entomologist, Washington, D. C., for use of illustration.

PEAR-LEAF BLISTER MITE.

Phytoptus pyri, Scheuten.

(Plate IX.)

Nearly all stocks used to graft the pear upon in this State have been imported, and with them came a very small mite (*Phytoptus pyri*) that seriously injures the growth of the tree. Reference was made to the existence of this mite in this State on page 439 of the Report of this Board for 1893–94. The effect of the mites upon the leaves is very similar in appearance to that produced by the "pear fungus" (*Entomosphorium maculatum*). Plate IX gives a good idea of its work. The three lower leaves show the gall stage, or the time that the mites are at work in the tissue. The upper three leaves represent the condition of the leaves after the galls have dried up. The effect upon the tree, when nothing has been done to check them, is a stunted growth and a diminished crop the following season.

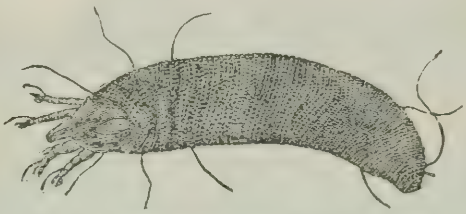


Fig. 4. Greatly enlarged. After Comstock.

The *Phytoptus* differs from the other mites in having but two pairs of legs, always located near the head (see Fig. 4), whereas the "red spider" (*Tetranychus*) has three pairs in the young stage and four pairs in the adult, and located upon the sides. The body of the *Phytoptus* is cylindrical, transparent, and long, as compared with the other portions of the mite. From the position of the legs it has to drag its body in walking.

Remedies.—Kerosene emulsion is considered the most effective wash for winter use. It was found that when it was diluted with from three to eight parts of water and sprayed on the infested trees before the leaves start, it was very effective. With the strongest solution the trees were practically free from this pest. Those sprayed with the weaker solution showed very few galls, not more than 1% that were on the trees the preceding year. Summer treatment with liquid remedies is of little avail. As soon as the leaves start in the spring they should be liberally treated with dry sulphur in the early morning, while yet damp with dew; a second and third application as the growth develops will be found effective.

GRAPE-LEAF PHYTOPTUS.

Phytoptus vitis ?

On August 5, 1896, samples of grape leaves, accompanied by letter, were received:

> "Here are some sample leaves from Florin, with some new disease, seems to be a mold. I am told of at least two vineyards affected by it, which makes it important enough, at least in my estimation, to have it investigated and reported on. No one seems to know cause, effect, or remedy."

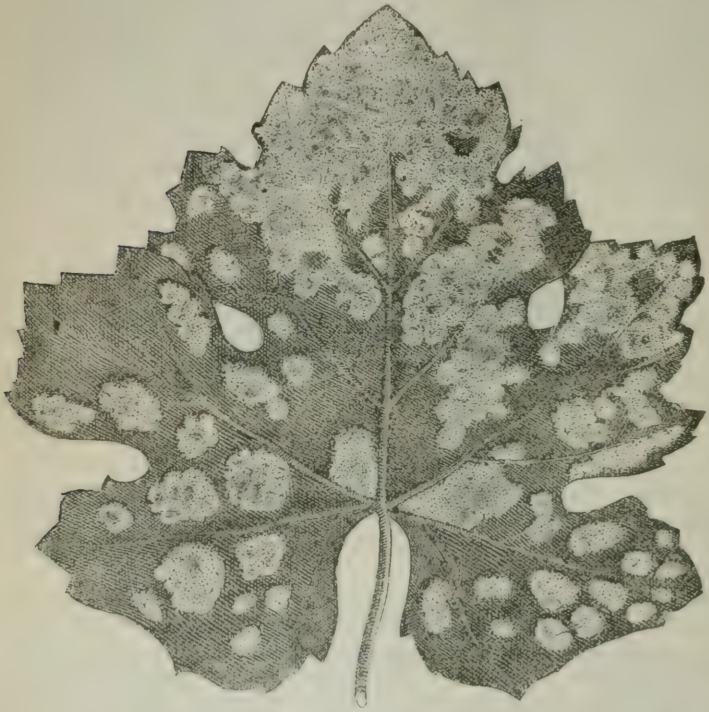


Fig. 5. Injurious effect on grape leaf by the *Phytoptus vitis.*

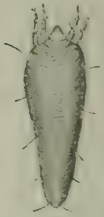


Fig. 6. *Phytoptus vitis*, greatly enlarged.

The accompanying leaves had all the characteristic appearances of a fungous growth upon the under side. In some instances this growth covered the entire under surface of the leaf, and in others it was in irregular patches. It is of a felt-like, spongy nature, and yellowish-brown in color. Fig. 5 represents an affected leaf. Upon examining the affected portion of a leaf with a microscope, under an inch objective, it could be seen that the spongy matter was alive with what appeared to be mites. With a $\frac{1}{5}$-inch lens the true character of the pest was revealed.

Description.—It is a *Phytoptus* having but two pairs of legs, near the head and reaching forward, as shown in Fig. 6. Upon the outer edge of each leg, between the tarsus and the claw, a bristle or hair protrudes that extends beyond the point of the claw. Along each side of the cylindrical body are three or four hairs in the adult stage. Near the caudal extremity of the body are two longer hairs, one on each side. The body is a silvery or light lemon color, with very delicate bands or segments encircling it.

From the condition of the leaves this insect is considered a very serious pest. No vine can be fruitful, with its leaves attacked by thousands of mites, sucking its juices and destroying its organs by which it builds up its alburnum and root system for the following year.

Preventive Measures and Remedies.—Vines attacked by this pest should have all dry leaves and rough bark removed from or about them and burned up, during the winter, and the vines after pruning should be thoroughly sprayed with rosin solution or kerosene emulsion. As soon as the leaves start they should be thoroughly dusted with sulphur, in such a way that it will reach the under side of the foliage. Another application of sulphur should be made just after the fruit is set. As sulphur is the most efficacious remedy for this class of pest, a liberal use of it in the early part of the season will prevent any injury. Do not defer the work until the blotches on the leaves are in evidence, for nothing can then restore the leaf to a healthy condition. No cuttings should be taken from such vineyards for planting in other districts. See that no boxes or pickers go from an infested vineyard into clean sections, as it can be carried on the boxes or clothing.

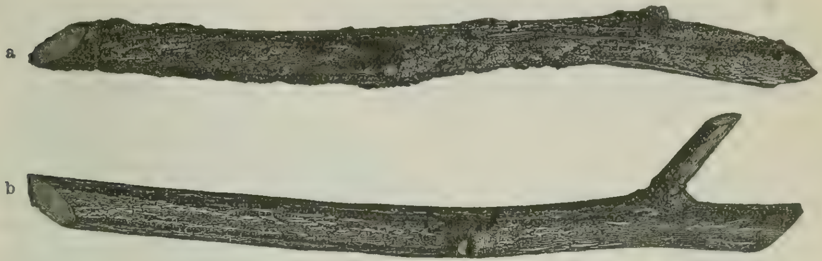


Fig. 7. Orange twigs showing effects of die-back; *a*, diseased; *b*, healthy.

FLORIDA ORANGE DIE-BACK.

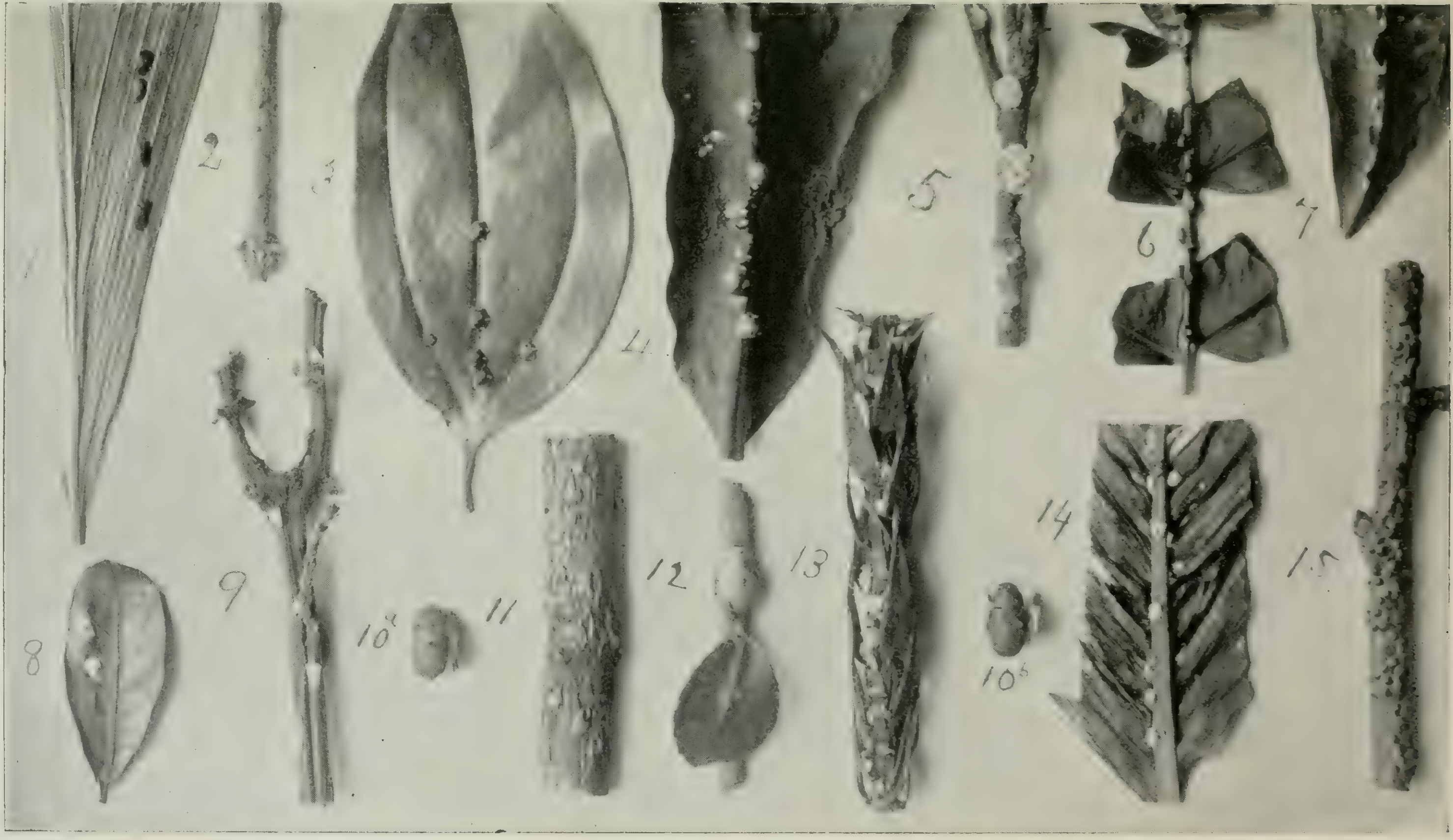
Exanthema.

This disease has done considerable damage in Florida. Walter T. Swingle and Herbert J. Webber, assistants in the Division of Vegetable Pathology of the Department of Agriculture, have investigated this disease in Florida and do not consider it contagious, but the cause is not yet thoroughly understood. Experiments and observations made by them lead to the conclusion that it is caused by malnutrition, the result of excessive use of organic nitrogenous fertilizers. As a remedy they recommend a discontinuance of such fertilizers, allowing weeds to grow and the use of a normal quantity of potash and phosphoric acid. As the trees recover a small amount of nitrogen should be given, in the form of nitrate of soda or sulphate of ammonia.

The principal symptoms of the disease are given in Bulletin No. 8 of the Division of Vegetable Pathology (to which Division we are indebted for use of the illustrations), from which we quote:

> "*Symptoms.*—1. The ends of the very rapidly growing shoots turn yellowish before maturing, and finally become stained reddish-brown in patches or throughout. This appearance is caused by a deposit in the outer cells of a reddish-brown, resin-like substance. This yellowing and staining of the twigs, which is very general on the new growth all over the tree, is followed by the dying back of the affected twigs for a short distance, usually three to six inches. The reddish stain may occur on the twigs back of the point to which they die, and, indeed, may spread in irregular patches more or less over the entire new growth.
>
> "2. On the new growth (most frequently at the nodes, but sometimes in the internodes) there occur comparatively large swellings, caused by gum pockets formed in the wood. These pockets frequently become quite marked.
>
> "3. Eruptions, caused by the bursting of the bark, very commonly occur on new and old twigs, as seen in the left-hand figure. In such cases the tissue swells up, protrudes from the rupture, and becomes stained by the reddish-brown, resin-like exudation which is so characteristic of the disease. These eruptions are very numerous, and in badly affected trees many limbs, from an inch in diameter down to the smallest, become thickly studded with them. This character almost invariably accompanies the disease, and is present at all seasons of the year, so that it may be regarded as the principal symptom. Trees may be slightly affected, however, and not show this symptom."

Specimens of diseased orange shoots were kindly forwarded to us by Mr. F. Austin, Secretary of the County Board of Horticultural Commissioners of San Diego County, found prevalent there on citrus trees brought from Florida. It would be well, therefore, for each Board of County Horticultural Commissioners in citrus-growing districts to take up this matter and have a careful examination made of all Florida-grown trees. The fact that the disease still existed in those trees after they had been planted in new soil and location for six years, would indicate that it is serious and not altogether controlled by treatment. No shoots should be taken from such trees for budding into other trees, or for nursery purposes.



Specimens of Foreign Injurious Insects Found on Trees and Plants Quarantined in the State.
From photograph; natural size.

EXPLANATION OF PLATE VI.

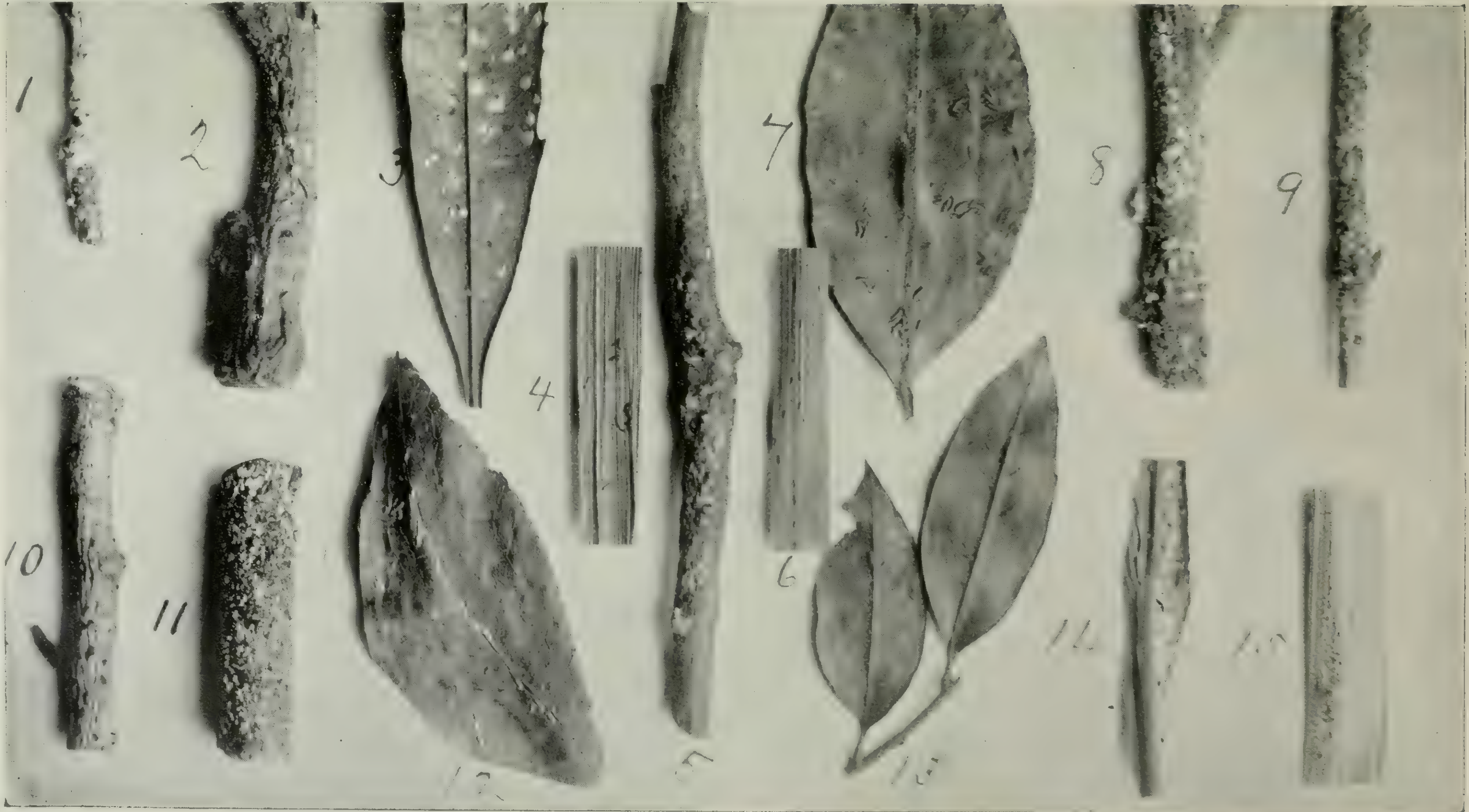
Scale Insects Found upon Quarantined Trees and Plants.

Fig. 1. *Lecanium perforatum*, Newstead. Hawaiian Islands, palms, etc.
Fig. 2. *Planchonia (Asterolecanium) fimbriata*, Fonscol. Mexico, ornamental plants.
Fig. 3. *Ceroplastes rubens*, Maskell. India, cinnamon plants.
Fig. 4. *Ceroplastes rubens*, Maskell. Honolulu, alligator pear trees, etc.
Fig. 5. *Ceroplastes ceriferus*, Anderson. Japan, orange, camellia, etc.
Fig. 6. *Lecanium nigrum*, Nietner. Hawaiian Islands, ferns, etc.
Fig. 7. *Lecanium longulum*, Douglass. Hawaiian Islands, orange, etc.
Fig. 8. *Pulvinaria psidii*, Maskell. Hawaiian Islands, orange, coffee, etc.
Fig. 9. *Orthezia insignis*, Douglass. Eastern States, coleus.
Fig. 10. *Adoretus umbrosus*, destructive beetle, Sandwich Islands.
Fig. 11. *Asterolecanium pustulans*, Cockerell. Honolulu, oleander.
Fig. 12. *Ceroplastes ceriferus*, Anderson. Japan, camellia, etc.
Fig. 13. *Dactylopius aurilanatus*, Maskell. Australia, *Araucaria bidwillii.*
Fig. 14. *Eriococcus* sp. Australia, palms.
Fig. 15. *Planchonia (Asterolecanium) quericola*, Bouche. Rochester, N. Y., oak.

EXPLANATION OF PLATE VII.

Scale Insects found upon Quarantined Trees and Plants.

Fig. 1. *Diaspis patelliformis*, Sasak. Honolulu, shrub.
Fig. 2. *Diaspis amygdali*, Cockerell. Japan, plums, etc.
Fig. 3. *Chionaspis chinensis*, Cockerell. China, on Quercus.
Fig. 4. *Ischnaspis filiformis*, Douglass. Japan, Pandanus.
Fig. 5. *Chionaspis biclavis*, Comstock. Tahiti, orange.
Fig. 6. *Fiorinia camelliæ*, Comstock. Honolulu, palms.
Fig. 7. *Mytilaspis citricola*, Packard. Guatemala, lime trees.
Fig. 8. *Chionaspis difficilis*, Cockerell. Japan, eleagnus.
Fig. 9. *Chionaspis euonymi*, Comstock. Japan, euonymus.
Fig. 10. *Parlatoria theæ*, var. *viridis*, Cockerell. Japan.
Fig. 11. *Chionaspis citri*, Comstock. Australia, orange, etc.
Fig. 12. *Mytilaspis carinata*, Cockerell. Acapulco.
Fig. 13. *Mytilaspis crawii*, Cockerell. Japan, *Quercus cuspidatus.*
Fig. 14. *Chionaspis aspidistræ*, Signoret. Japan, *Aspidistra lurida.*
Fig. 15. *Parlatoria victrix*, Cockerell. Cairo, Egypt, date palms.



Specimens of Foreign Injurious Insects Found on Trees and Plants Quarantined in the State.
From photograph; natural size.

EXPLANATION OF PLATE VIII.

Scale Insects Found upon Quarantined Trees and Plants.

Fig. 1. *Diaspis lanatus*, Morgan & Cockerell. Japan, cherry.
Fig. 2. *Aspidiotus ficus*, Ashmead. Japan, *Aspidistra lurida.*
Fig. 3. *Chionaspis assimilis*, Maskell. Australia, plant like eucalyptus.
Fig. 4. *Aspidiotus rossii*, Maskell. Australia, olive, acacia, etc.
Fig. 5. *Parlatoria pergandei*, Comstock. Florida, orange.
Fig. 6. *Aspidiotus sphærioides*, Cockerell. Louisiana, plant like Cordylina.
Fig. 7. *Chionaspis biclavis*, Comstock. Mexico, guava.
Fig. 8. *Chionaspis biclavis*, Comstock. Mexico, gardenia.
Fig. 9. *Aspidiotus albopunctatus*, Cockerell. Japan, orange.
Fig. 10. *Pollinia costæ*, Targ-Toz. Italy, olive.
Fig. 11. *Aspidiotus duplex*, Cockerell. Japan, orange, etc.
Fig. 12. *Diaspis amygdali*, Cockerell. Japan, walnut.
Fig. 13. *Aspidiotus* sp. Mexico, ornamental plants.
Fig. 14. *Mytilaspis gloverii*, Packard, Japan.

IX.

REMEDIES FOR THE DESTRUCTION OF INSECT PESTS, FUNGI, ETC.

LIME, SULPHUR, AND SALT FOR WINTER USE UPON DECIDUOUS TREES.

For Pernicious Scale, and as a Preventive of Curl Leaf on Peach Trees.

The following formula and directions, if properly carried out, will produce an effective solution:

Unslacked lime	40 pounds.
Sulphur	20 pounds.
Stock salt	15 pounds.
Water to make 60 gallons.	

Directions.—Place 10 pounds of lime and 20 pounds of sulphur in a boiler with 20 gallons of water, and boil over a brisk fire for not less than one hour and a half, or until the sulphur is thoroughly dissolved. When this takes place the mixture will be of an amber color. Next place in a cask 30 pounds of unslacked lime, pouring over it enough hot water to thoroughly slack it; and while it is boiling add the 15 pounds of salt. When this is dissolved, add to the lime and sulphur in the boiler and cook for half an hour longer, when the necessary amount of water to make the 60 gallons should be added.

ROSIN WASH FOR WINTER USE UPON DECIDUOUS TREES OTHER THAN PEACH.

For Pernicious Scale and Lecaniums.

The following are the proportions of materials for the winter wash:

Rosin	30 pounds.
Caustic soda (70%)	9 pounds.
Fish oil	4½ pints.

Directions for Preparing the above Wash.—Place the rosin, caustic soda, and fish oil in a large boiler, pouring over them about 20 gallons of water, and cook thoroughly over a brisk fire for at least three hours; then add *hot* water, a little occasionally, and stir well until you have not less than 50 gallons of hot solution. Place this in the spray tank and add cold water to make the necessary amount. Never add *cold* water when cooking.

SUMMER WASH FOR PERNICIOUS SCALE, FUNGUS, ETC., UPON DECIDUOUS TREES.

Whale-oil Soap and Sulphide of Potash.

Whale-oil soap (80% strength)	20 pounds.
Sulphur	3 pounds.
Caustic soda (98%)	1 pound.
Commercial potash	1 pound.
Water to make 100 gallons.	

Directions.—Place sulphur, caustic soda, and potash together in about 2 gallons of water, and boil for at least one hour, or until thoroughly dissolved. Dissolve the soap by boiling in water; mix the two and boil for a short time. Use the solution warm.

ROSIN WASH FOR CITRUS TREES INFESTED WITH RED SCALE.

Rosin	20 pounds.
Caustic soda (70%)	6 pounds.
Fish oil	3 pounds.

Water to make 100 gallons.

The directions for preparing this wash are the same as those given for the rosin wash recommended for winter use upon deciduous trees. August and September are the best months to spray citrus trees.

ROSIN WASH FOR NEWLY HATCHED BLACK OR SOFT BROWN SCALE UPON CITRUS TREES.

Rosin	18 pounds.
Caustic soda (70%)	5 pounds.
Fish oil	2½ pounds.

Water to make 100 gallons.

The directions for preparing this remedy are the same as given for the rosin wash for winter use upon deciduous trees. In most districts of the State the black scales have hatched before the end of August, therefore September is a good time to apply this remedy.

FOR BLACK SCALE ON OLIVE TREES.

Directions for making emulsion:

Kerosene oil (Pearl, 150° test)	5 gallons.
Common laundry soap	1¼ pounds.
Water	2½ gallons.

Dissolve the soap by boiling in 2½ gallons of water, and while boiling remove to another vessel; add the kerosene, and churn for fifteen minutes, or until a stable emulsion is formed. Afterward dilute with 6½ gallons of hot water for each gallon of oil, and to the mixture add 2½ pounds of home-made soap dissolved in hot water. Apply at a temperature of 140° F.

FOR COTTONY CUSHION SCALE.

Rosin	20 pounds.
Caustic soda (70%)	6 pounds.
Fish oil	3 pounds.

Water to make 100 gallons.

The directions for preparing this wash are the same as those given for the rosin wash for winter use upon deciduous trees.

Or, secure a colony of *Vedalia cardinalis* or *Novius Koebelei*.

August and September are the best months to spray citrus trees.

FOR APHIS UPON PLUM, PRUNE, AND APPLE TREES.

Caustic soda (98%)	1 pound.
Rosin	6 pounds.
Water	40 gallons.

Directions.—Prepare as directed in " rosin wash for winter use.'

FOR FLOWERING SHRUBS OR GARDEN PLANTS.

Whale-oil soap (80% strength)	½ pound.
Water	1 gallon.

Directions.—Dissolve soap by boiling, and apply at a temperature of 100° to 120° F. For very tender plants the proportion of soap should be less.

FOR FLAT-HEADED BORERS.

Guard the stems of trees from infection by placing a shake or board on the south and west sides of the tree, which protects them from sunburn; or give a coating of whitewash, containing some soap and sulphur. In removing a borer, smear the wound over with grafting wax.

FOR PEACH-ROOT BORER.

Remove a few inches of the soil at the base of the tree in April, before the moths deposit their eggs, and wrap up the trunk for ten inches with stout paraffine paper, tie at top, and pile up against the paper a few inches of dry soil. In the winter remove the protectors, and examine the trees for borers. If gum exudes it is generally an indication of the presence of a borer. Carefully remove the bark with a sharp knife, and destroy the pest. Place sand against the wound, and replace the protector. A coating of whitewash, in which a little soap and sulphur have been mixed, and applied to the bark at the base of the tree, will prevent the moths from depositing their eggs.

FOR WOOLLY APHIS.

Dress liberally with ashes or air-slacked lime, especially in moist localities.

Brush or spray with kerosene emulsion or rosin solution, as recommended for aphis on plum, prune, and apple trees.

FOR CANKER OR MEASURING WORMS.

The wingless female moths should be prevented from climbing the trees to deposit their eggs in the fall. This can be done by placing a wire-netting trap, as shown on Plate XI, Fig. 2. First place around the tree a piece of cotton batting, and then a strip of wire netting of No. 16 mesh, 6 or 8 inches wide. Tie at top with cord or wire. See that the netting does not touch the tree at bottom. The insects will collect under it and go up as far as they can, being attracted by the light through the netting, and there perish. The season of oviposition in California is from the beginning of November until the end of December. After the female has ceased crawling or hatching, the traps should be removed and scalded, as eggs deposited on them will hatch and the minute larvæ will get through the mesh. The trunks of the trees below the trap should also be scrubbed or coated with a thick whitewash.

Remedy against the Larva.—Spray the infested trees with 1 pound of Paris green to 200 gallons of cold water. To make the Paris green more insoluble and thereby prevent injury to the leaves, dissolve 6 pounds of fresh lime in water and add the latter to the solution. Keep the mixture constantly stirred when spraying.

FOR PEAR OR CHERRY SLUGS.

Use the Paris green solution, as recommended for canker worms, or throw dry pulverized soil or dust over the infested trees. This adheres to the slugs, causing them to drop to the ground, where they die.

FOR TENT AND TUSSOCK MOTH CATERPILLARS AND OTHER LEAF-EATING WORMS.

Spray with Paris green, as recommended for canker or measuring worms.

COMBINED REMEDY FOR CODLIN MOTH AND APPLE SCAB.

The Paris green solution has almost entirely superseded the band and trap system of fighting codlin moth (*Carpocapsa pomonella*). No matter how carefully the bands and traps were attended to, enough larvæ escaped so that there appeared to be as many wormy apples or pears the following season as before. With Paris green we destroy the worms before they have damaged the fruit. This is certainly more satisfactory to the orchardist, and requires less attention and work. No ammonia or soap should be used in the solution. In California we find that 1 pound of Paris green to 200 gallons of cold water is as much as the foliage will stand. The poison should be made into a paste before placing in the tank, and during the operation of spraying it should be *constantly* stirred.

Many poor and unsatisfactory results have been constantly reported, due entirely to adulterated Paris green. Growers should get a written guarantee from the dealers that the article contains at least 50% arsenious acid.

If any indications of "apple scab" (*Fusicladium dentriticum*) are observed, the following can be added to the Paris green solution: Dissolve 25 pounds of sulphate of copper in 20 gallons of water; slack 20 pounds of fresh lime; add to the copper solution, and strain into the spray tank with the Paris green, making 200 gallons of wash. This should be applied with a fine spray, and only sufficient used to each tree to thoroughly moisten it without running off. If the mixture has been constantly stirred, this will distribute sufficient Paris green over the young fruit to destroy the larvæ of the codlin moth before they burrow. The spraying should be done soon after the blossoms drop, and before the fruit turns downward. A second application should be made about sixteen days after the first, and in some districts a third application (of Paris green), at three weeks interval from the second, will be beneficial.

FOR DIABROTICA AND OTHER LEAF-EATING BEETLES.

Thoroughly mix 5 ounces of Paris green with 20 pounds of sulphur. Apply with sulphur-bellows in the morning, when the leaves are damp.

FOR GRASSHOPPERS OR LOCUSTS.

Thoroughly mix 40 pounds of bran, 20 pounds of middlings, and 20 pounds of arsenic; then add 2 gallons of cheap molasses and sufficient water to moisten the whole. Place a tablespoonful of the mixture a few inches from the tree or vine. Keep fowl and other domestic animals out of the orchard during the time the poison is out.

FOR RED SPIDER, YELLOW MITE, PEAR BLISTER MITE, AND LIGHT THRIPS.

Soon after the trees are in leaf in spring and while they are damp with dew in the morning, thoroughly dust them with sulphur. Use sulphur-bellows, or, if the orchard is extensive, fix up a broadcast seeder on a wagon. With this arrangement an orchard can be treated very thoroughly and with dispatch. Infested orchards should be treated at least three times during the spring and early summer.

FOR SHOT-HOLE AND OTHER FUNGI.

The trees should be sprayed with the "lime, sulphur, and salt" remedy before the buds start, and as soon as the fruit is set use the following: Dissolve 6 ounces of common glue by boiling in 1 gallon of water, and 2 pounds of carbonate of copper in 4 gallons of cold water. Mix the two, stirring well. Dilute with warm water to make 100 gallons of solution. Keep constantly stirred and apply with a fine spray.

GAS TREATMENT FOR DESTROYING SCALE INSECTS UPON CITRUS TREES.

Hydrocyanic acid gas is the most effective remedy for killing the "red scale" (*Aspidiotus aurantii*), the "purple scale" (*Mytilaspis citricola*), and other armored scales that have as yet no effective parasite to keep them in check. This gas is produced by the chemical action of sulphuric acid upon cyanide of potassium. The proportions of chemicals necessary for different sized trees near the coast and in the interior are given in separate tables.

To prepare the gas, the following instructions must be carefully observed: Place the necessary amount of cyanide of potassium, together with sufficient water, in an earthenware vessel; when the tent or canvas has been put over the tree and everything is in readiness, place the vessel under the canvas and add the sulphuric acid; a piece of sacking or burlap should be thrown over the top to spread the gas and prevent it from burning the leaves immediately above the generator. The tent must be made air tight around the bottom as soon as the acid is put in. This can be done by simply throwing some loose soil over the bottom of the canvas. The grade of cyanide of potassium that has given the most satisfaction and most uniform results is the fused (60%). It should not be left exposed, as it has a strong affinity for water and withdraws the moisture from the air, thus adding considerably to its weight.

The following table, giving height of trees and the proportions of chemicals and water, will be found suitable for districts in the interior or beyond ten miles in a direct line from the seacoast:

Height of Trees—Feet.	Diameter through Foliage—Feet.	Water—Fluid Ounces.	Sulphuric Acid—Fluid Ounces.	Cyanide of Potassium—Ounces.
6	4	2	1	1
8	6	4	2	2
10	8	6	3	3
12	10	10	5	5
12	14	14	7	7
14	14	16	8	8
16	16	18	9	9
18	16	20	10	10
20	16	22	11	11
22	18	24	12	12
24	20	26	13	13
26	20	27	13½	13½
30	20	28	14	14

One would suppose that a tree having a dense foliage would fill up the space within the tent, and require less gas to be effective. But the cold surface of the leaves condenses the gas, and fumigators find that a slightly heavier charge of chemicals is necessary for such a tree, and where the foliage is scant a less amount than is given in the table will answer. In the experiments made near the coast it was found necessary to increase the amounts on large trees in order to do good work. The following table has been adopted for use near the coast:

Height of Trees—Feet.	Diameter through Foliage—Feet.	Water—Fluid Ounces.	Sulphuric Acid—Fluid Ounces.	Cyanide of Potassium—Ounces.
6	4	3	1¼	1
8	6	6	2½	2
10	8 to 10	12 to 15	4 to 5	3½ to 4½
12	10 to 14	18 to 26	6 to 8¾	5 to 7
14	12 to 14	26 to 30	8¾ to 10	7 to 8
16	14 to 16	33 to 37	11 to 12½	9 to 10⅔
20	16 to 18	48 to 56	16 to 18¾	13 to 15
24	18 to 20	67 to 75	22½ to 25	18 to 20

The cyanide should be used as coarse as possible, so that the chemical action will be less violent. The gas is also generated more evenly, and there is not so much danger of the chemicals boiling over or spattering the tent. The tent should remain closed for not less than forty minutes. This time is required to kill the eggs of the armored scales. As soon as the tent is removed the vessel should be rinsed with clean water and prepared for another charge, while the men are changing the tent.

The Sheet-Tent (see Plate X).—This is a very simple arrangement and the most satisfactory tent now in use, and one that has greatly reduced the cost of a fumigating outfit. The illustration is of an outfit at work on an orange grove. The two poles, or uprights, are of dressed Oregon pine, 2x4 inches and 24 feet high. Across the bottom of the poles are bolted—one on each side—two pieces 1x3 inches and 6 feet long. From each end of the cross-pieces a brace, 2x4 inches and 4 feet long, is fastened to the upright pole. The cross-bar prevents the pole from falling sideways when raising the tent over the tree. A ¾-inch guy rope, 33 feet long, is fastened at the top of each pole in front. A

4-inch block is fastened in the rear at top, and another block where the braces join the upright; through these is passed a $\frac{7}{8}$-inch rope 70 feet long, to raise the tent. In raising the sheet the edge is gathered, and a hitch with the rope around it makes it fast, so that it can be drawn up. When all is ready the sheet is dropped on one side of the tree; the uprights are raised, one on each side; the ropes are adjusted to the edge of the sheet and hoisted; each upright is steadied by a man with the guy rope. When raised sufficiently, the men pull on the guys, thus bringing the sheet forward and over the tree. The uprights are allowed to drop on the ground, leaving the tent in position.

X.

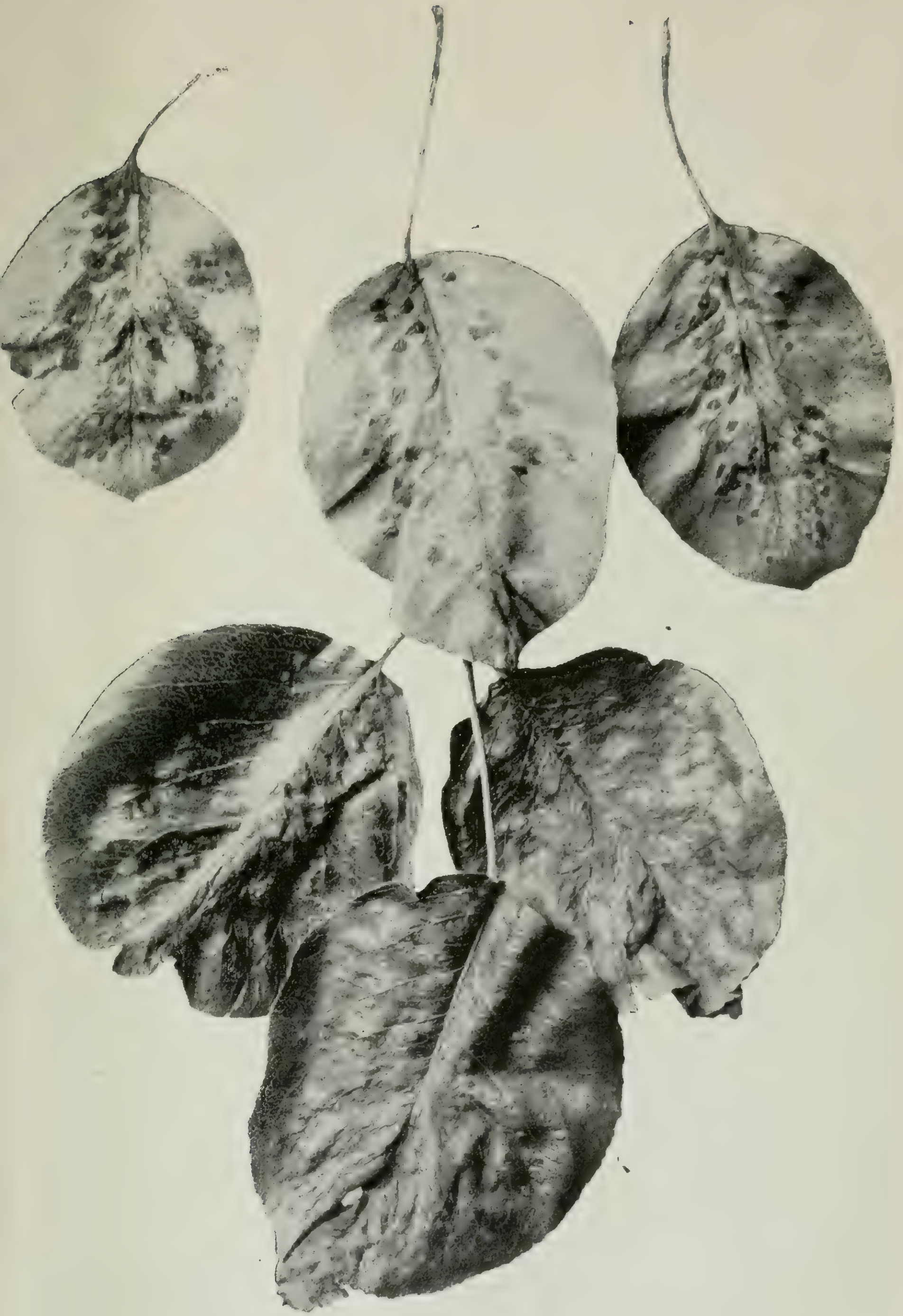
ACKNOWLEDGMENTS.

In acknowledging the valuable assistance rendered this department by your Excellency, without which it would have been impossible for us to succeed in the administration of our affairs and the completion of the present volume, we extend to you our most hearty and sincere thanks. It also affords us great pleasure to acknowledge with gratitude the valuable assistance and financial aid rendered this department by the fruit-growers of the State, and especially by Mr. A. B. Chapman, of San Gabriel, Mr. N. W. Blanchard, of Santa Paula, Mr. E. E. Goodrich, of Santa Clara, Mr. Timothy Hopkins, of San Francisco, Mr. D. O. Mills and his able Superintendent, Mr. H. H. Taylor, of San Francisco, the Saratoga Packing Company, of Los Gatos, the Limonia Company, of Ventura, and others.

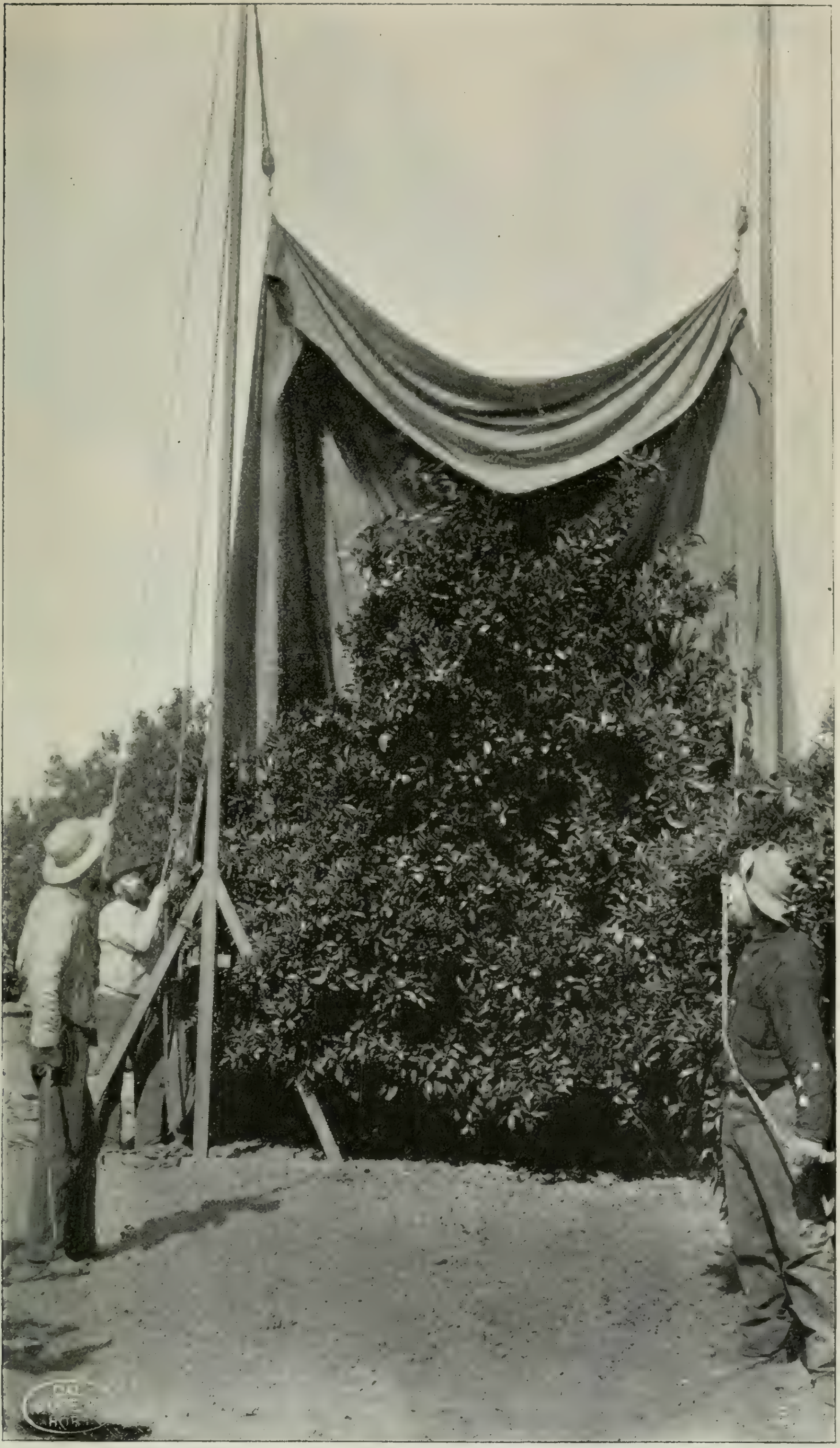
To Hon. L. H. Brown, Secretary of State, our thanks are especially due for having provided us, at your request, with suitable offices in the State Capitol, and also for having assisted in fitting up same. Hon. A. J. Johnston, Superintendent of State Printing, has merited our thanks for furnishing us with photographic electro plates and for other assistance, without which our report would have been lacking in interest. To the Board of State Harbor Commissioners our thanks are specially due for having provided us, in accordance with your request, with suitable rooms on the waterfront for a branch office, where our Quarantine Officer is stationed. To Cornell University Experiment Station, and to Prof. J. Henry Comstock and his assistant, Prof. M. V. Slingerland, our thanks are due for the loan of the cuts of pear psylla, bud moth, and cigar-case bearer, shown in Plates I and II. To the State Board of Agriculture of Massachusetts, Prof. E. H. Forbush, Director of Field Work, for the use of plate showing the cutting and burning of woods infested with gypsy moth, we tender our thanks. To the California Nursery Company, of Niles, Mr. John Rock, President, our thanks are due for donations to the Board, consisting of an extensive variety of walnuts and almonds, also olives and olive oil, in variety; to Mr. A. F. Abbott, of Yuba City, for the donation of an extensive collection of dried and preserved fruits, in variety, now on exhibition in our offices in the State Capitol. To our old friends and associates, for many years members of this Board, Hon. I. H. Thomas, of Visalia, and Hon. J. L. Mosher, of San Francisco, we extend our hearty and warmest thanks for the many years of gratuitous servitude to the State in behalf of the horticultural interests. To our officers and clerks our thanks are extended. We desire to compliment them all for their indefatigable efforts in the performance of their respective duties.

ELLWOOD COOPER,
MARK L. McDONALD,
FRED C. MILES,
R. D. STEPHENS,
FRANK A. KIMBALL,
SOL. RUNYON,
BEN M. MADDOX,
A. BLOCK,
FRANK H. BUCK,
Commissioners.

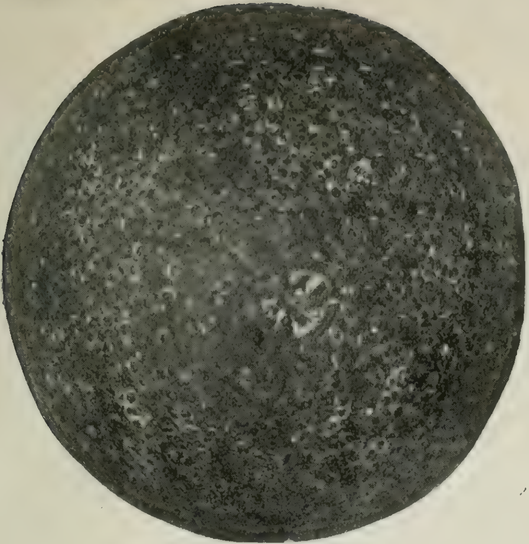
B. M. LELONG,
Secretary, and Chief Horticultural Officer.



LEAVES AFFECTED BY THE PEAR LEAF BLISTER MITE (*Phytoptus pyri*).
The lower leaves show the gall stage; the upper leaves represent the condition of the leaves after the galls have dried up.



Improved Apparatus for Treating Citrus Trees with Hydrocyanic Acid Gas—Sheet Tent.



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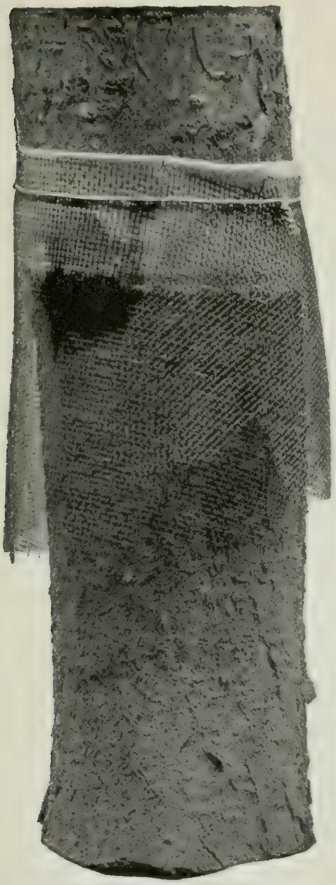

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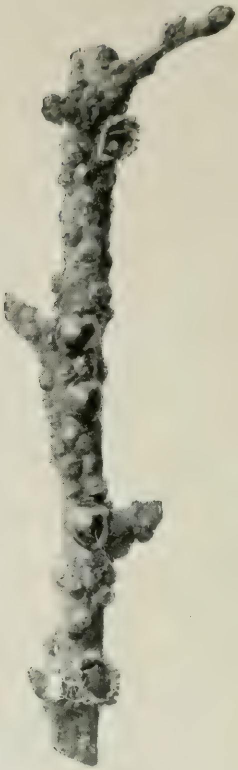

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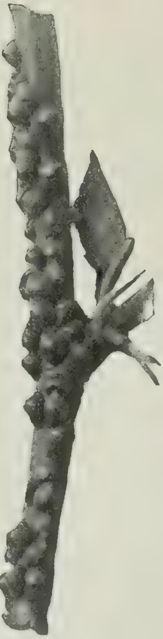

4.

1. Navel orange badly infested with red scale (*Aspidiotus aurantii*).
2. Wire-netting trap used extensively in Santa Clara County to prevent the cankerworm from ascending trees.
3. Prune branch infested with black scale (*Lecanium oleæ*), showing the twice-stabbed lady-bug at work.
4. Prune branch infested with the brown apricot scale.

REPORT

OF

B. M. LELONG,

Secretary, and Chief Horticultural Officer.

REPORT OF B. M. LELONG,

Secretary, and Chief Horticultural Officer.

XI.

REVIEW OF THE FRUIT SEASONS 1895-96.

The fruit season of 1895 opened very encouragingly, but prices obtained throughout the season as a whole proved a great disappointment to the growers of fresh deciduous fruits. Chief among the causes which led to the deplorable results of the season were, constant glutting of the Eastern markets by the indiscriminate shipments of fruit consigned to parties unqualified to handle the product intelligently, and the existence of two or more auction salesrooms at many Eastern auction points.

In November, 1894, a convention of fruit-growers was held under the auspices of this Board, in the State Capitol at Sacramento, and the subject was thoroughly discussed, which resulted in the establishment of an association known as the Fruit Growers and Shippers' Association, in accordance with the following resolution:

> WHEREAS, Owing to certain causes, the shipping of fresh fruits to the markets of the East has more recently proven highly unprofitable; and whereas, a continuance of these causes must mean ruin to untold numbers of growers, and must seriously threaten the future of the fresh-fruit industry of our State; and whereas, we have reason to believe that by united action on the part of commercial shippers, local associations, and individual growers shipping in carload lots and routeing their own fruit, many of these causes may be promptly removed, and certain existing evils overcome; therefore, be it
>
> *Resolved*, That without reference to any great popular movement to unite the fruit-growers of the State in one organization for general purposes, but in addition and auxiliary to that movement, this convention recommends and earnestly requests the classes of growers and shippers above mentioned to proceed forthwith to organize themselves into a union to be known as the Fruit Growers and Shippers' Association of California; and be it further
>
> *Resolved*, That the purposes of the proposed association shall be: (1) the establishment of a Bureau of Information to regulate distribution; (2) to establish one auction-room in each city; (3) to make such auction-rooms open and free to all buyers; (4) to do all such other things as may be conducive to the best interests of the fresh-fruit industry of California; and be it further
>
> *Resolved*, That the President of the convention be requested to appoint a committee of five, which shall represent all the above classes of shippers, for purpose of taking steps to carry the above resolution into effect; and be it further
>
> *Resolved*. That the California Fruit Exchange, as it proceeds in its work of organization, be requested to make the importance of maintaining such association very prominent, and to impress upon all growers the necessity of strongly supporting it in all ways; and be it further
>
> *Resolved*, That the members of this convention hereby pledge themselves to give such association, when formed, our continuous and hearty support.

A bureau of information was established, with headquarters at Sacramento, and daily bulletins issued throughout the season, which were of incalculable value to the growers and largely prevented unnecessary gluts, and kept the growers informed as to the movements and distribution of their fruit. That this association would have easy sailing was a source of much doubt in the minds of its projectors, who duly considered the conflicting interests among buyers and sellers in the East, and which they tried to avert, but without success. Consolidated salesrooms were operated in Chicago, Boston, and New York, much to the detriment of shipments of California fruit, by forcing the same into needless competition with itself, to the disadvantage of the shippers.

At the subsequent convention held at Sacramento, in November, 1895, a report was made by the President of the Association, Mr. H. Weinstock, covering the period of the year's shipments, in which report all matters are treated in detail (see Report Nineteenth Fruit-Growers' Convention, pp. 10–17). The convention passed the following resolutions:

WHEREAS, The fruit-shipping season of 1895 has made it plainer than ever that in order to prevent California fruit from coming into needless competition with itself, and in order to give the California fruit-grower the benefit of the fullest and freest competition among all buyers and all auctioneers at each auction point, it is imperative that the sales of California fruit shall be held in consolidated salesrooms, where all buyers and all auctioneers in each city may be brought at the same hour under one roof; therefore, be it

Resolved, That the California fruit-growers assembled in State convention, under the auspices of the State Board of Horticulture, do hereby call upon the shippers and receivers of California fresh fruits to coöperate with the growers in establishing and maintaining such consolidated auction salesrooms;

Resolved, In order that growers may avail themselves of the privilege of shipping either over the Erie or West Shore railway lines to the City of New York, that it is the expressed desire of the California growers that an outside room be selected, convenient to the piers of the above railroads, to be used as the consolidated salesroom for the City of New York, which consolidated salesroom shall be open to all auctioneers of California fruits upon equal terms and conditions, so long as such auctioneers conduct sales which are free and open to all buyers;

Resolved, In order that growers and shippers may have the privilege of routeing their fruit over any one of the several railway lines entering Chicago, that a railway terminal shall be chosen in said city, which shall be free and open to all competing railway lines, subject to the established charges for switching, unloading, etc, and that the auction salesroom at such terminal shall be free and open to all auctioneers upon equal terms and conditions, so long as such auctioneers conduct sales which are free and open to all buyers;

Resolved, That we solemnly pledge ourselves to confine our support to such shippers and receivers as comply with these resolutions.

In the discussion that followed, it was contended that higher prices were obtained on the Erie than on the West Shore pier. The following figures are given, showing the number of packages sold and amount realized:

New York Sales from August 12th to October 19th, inclusive.

	West Shore.			Erie.		
	Number of Packages.	Amount Realized.	Average Price per Package.	Number of Packages.	Amount Realized.	Average Price per Package.
Bartletts	26,431	$54,430	$2 06	17,272	$32,714	$1 88
Assorted Pears	1,442	2,653	1 84	1,867	2,813	1 50
Prunes	11,604	13,851	1 20	11,373	10,875	96
Plums	3,850	3,778	98	2,384	2,311	97
Peaches	31,489	26,198	83	38,238	31,999	83
Tokays, s.c.	44,583	4,335	1 11	40,194	46,589	1 13
Tokays, d. c.	7,648	15,718	2 06	6,217	14,103	2 27
Muscats	3,593	2,937	82	5,163	5,135	99
Assorted Grapes	3,483	3,581	1 03	6,061	4,635	76
	134,123	$127,481	....	128,769	$151,174	....

Total realized on Erie	$151,174 00
If sold at Union prices would have realized	158,197 00
Loss to Erie	$7,023 00

Or a little more than 5%.

The foregoing figures show that the Erie sales realized on an average 5% less than the prices received on the West Shore pier, operated by the Association.

The work of the Fruit Growers and Shippers' Association was approved by the convention, as the following resolution shows:

WHEREAS, A resolution was adopted unanimously at the Eighteenth Fruit-Growers' Convention, providing for the formation and organization of commercial shippers, local associations, and individual growers shipping in carload lots, into a union to be known as the California Fruit Growers and Shippers' Association, to provide for (1) the establishment of a bureau of information to regulate the distribution of fresh fruit; (2) to establish one auction-room in each city; (3) and to make such auction-room open and free to all buyers; and whereas, such an association was formed and has earnestly endeavored to accomplish the results set forth in such resolution, and to remedy the grave evils that in the past have caused the shipping of fresh deciduous fruits to the markets of the East so unprofitable to the grower; and whereas, this convention, recognizing the zeal with which said labors were performed by said association, and the energy and time so freely given by the members thereof, for the benefit of the fruit industry of the State; therefore, be it

Resolved, That the fruit-growers of California, in convention assembled, do hereby most heartily approve of the actions of said association in its endeavors to bring into existence conditions that would make the growing of fruit in this State a profitable industry, and we commend the zeal of its members and officers, and hereby pledge it our hearty and continued support.

With the view of bringing about a unity of action and harmony among conflicting interests, a committee was appointed, in accordance with the following resolutions:

Resolved, That the Chairman of this convention appoint a conference committee of seven members, who shall be chosen so as to represent all of the interests of the fresh deciduous fruit industry of this State; and be it

Resolved, That such committee shall meet at an early date, and shall request the attendance of all interested parties with the view of harmonizing such conflicting interests as may exist; and be it

Resolved, That all commercial shippers, fruit-growers, and other persons be and are hereby respectfully requested to respond to any request of such committee for attendance, and lend to it their most earnest support.

The committee met on the 8th of April, 1896, and adopted resolutions, which they submitted to the association at a meeting in Sacramento, April 11th, tending to harmonize conflicting interests, and which the association adopted, as follows:

WHEREAS, At the State Convention of Fruit-Growers, held in Sacramento, November 18, 1895, a Committee of Conference, consisting of seven growers and shippers, representing the various elements engaged in the fresh-fruit trade, were appointed, with instructions from the convention to harmonize existing differences between shippers and growers, with the view of establishing consolidated auction salesrooms in the various Eastern markets for the sale of California fresh fruits; and whereas, said Committee of Conference having thoroughly gone into the matter, and having found that the consolidated salesrooms established on neutral ground, convenient to the various railroad terminals in each city, are not alone entirely practical and desirable, but for the welfare of the fruit interests are imperative; be it therefore

Resolved, That this Committee of Conference do hereby call upon the California Fruit Growers and Shippers' Association to establish such consolidated auction salesrooms upon neutral ground in the various Eastern cities, said salesrooms to be under the absolute control of the California Fruit Growers and Shippers' Association, and made free and open to all buyers, auctioneers, receivers, and shippers of California fresh fruits upon a fair and equitable basis to all, under such rules and regulations as the Association may establish; and be it further

Resolved, That this Committee of Conference, representing as it does the growers and shippers of fresh fruit of the State of California, hereby earnestly call upon all growers, shippers in carload lots, and upon all coöperative societies and fresh-fruit shipping companies whose names are not yet enrolled, to become members of the California Fruit Growers and Shippers' Association, and to lend their fullest and heartiest support to said association in its endeavors to carry out the desire of the growers and shippers of California to establish and maintain consolidated auction salesrooms free and open to all, and to continue the publication of daily bulletins, tabulating the daily shipments of fruit for the guidance of growers and shippers;

Resolved, That it is the sense of the Fruit Growers and Shippers' Association that directors of the association be authorized to proceed to establish consolidated auction salesrooms upon neutral ground in the various Eastern cities, said salesrooms to be under the absolute control of the California Fruit Growers and Shippers' Association, and made free and open to all buyers, auctioneers, receivers, and shippers of California fresh fruits, on a fair and equitable basis to all, under such rules and regulations as the association may establish.

After the election of a Board of Directors, the following rules for the governing of the auctions and auction-rooms were adopted:

Rule 1. This auction-room is absolutely open and free to all buyers who can conform to the terms of sale.

Rule 2. Time of holding the sale shall be left to the discretion of the receivers and auctioneers, except that after the sale commences it shall be continuous until all the fruit to be sold on that day has been disposed of.

Rule 3. Any auctioneer or auction company selected by the receiver whose fruit is to be sold can sell in this room, providing said auctioneer or auction company subscribe to the rules established by this association.

Rule 4. All fruit to be sold shall be displayed at the terminals. Same shall be in charge of the receiver, and shall be ready for inspection at least one hour before the sale commences.

Rule 5. Fruit shall be catalogued in a manner that is entirely equitable to all receivers, and the different receivers will be given alternate cars on the catalogue.

Rule 6. The premises will be furnished free by the California Fruit Growers and Shippers' Association, but the auctioneers shall pay between them the cost of porterage or janitorship, and rent of telephone, light, and heat.

Rule 7. Before making returns to receivers the auction company shall withhold —— per car, to be remitted to the California Fruit Growers and Shippers' Association.

SHIPMENTS OF FRESH FRUIT.

The shipments of fresh fruit East, in 1895 and 1896, up to September 10th, are given in the following report, from the President and General Manager of the California Fruit Growers and Shippers' Association, prepared by special request, for which we make due acknowledgment:

Cities.	June. (No. of Cars.)		July. (No. of Cars.)		August. (No. of Cars.)		11 days in September. (No. of Cars.)	
	1895.	1896.	1895.	1896.	1895.	1896.	1895.	1896.
Chicago	140	115	272	187	354	266	225	186
New York	80	79	166	185	265	340	174	170
Boston	28	28	72	99	109	173	42	75
Philadelphia	15	11	20	19	23	31	16	6
Minneapolis	15	16	31	30	49	56	21	20
Baltimore	8	9	10	3	8	1	1	0
Cincinnati	2	0	0	0	7	0	1	0
Kansas City	6	3	13	14	22	27	9	10
Montreal	3	6	23	29	33	42	7	2
New Orleans	3	4	5	6	16	17	19	23
Denver	6	4	26	22	36	42	9	15
St. Louis	11	4	7	5	20	11	16	15
St. Paul	10	9	17	12	47	37	27	17
Omaha	13	7	51	18	64	24	28	11
Cleveland	2	0	13	3	23	6	4	1
Pittsburg	2	5	9	6	14	9	7	3
Buffalo	1	1	4	4	13	2	3	0
Milwaukee	0	0	9	10	19	15	13	4

	1895.	1896.
Total number of cars shipped to June 30	543	449
Total number of cars shipped to July 31	1,690	1,405
Total number of cars shipped to August 31	2,989	2,602
Total number of cars shipped to September 11	3,408	3,050

It will be noted that up to September 10th the shipments for 1896 have been a little over 10% less than in 1895. The present indications are that the increased shipments over last year, beginning with September 1st, may overcome the decline in the season's shipments prior to that date, provided there are no rains during September and October, and the present fair-sized grape crop can all be harvested.

The shipping season up to date has not been an entirely satisfactory one. While on the one hand the California Fruit Growers and Shippers' Association has been entirely successful in bringing about a harmony of spirit and a unity of action among shippers and growers, and has thus been able to establish in the principal Eastern auction markets consolidated auction salesrooms free and open to all auction companies, buyers, shippers, and receivers, other conditions this season, however, have been such as to seriously depress prices on certain lines of fruit. While plums and prunes have, as a rule, brought very satisfactory prices throughout the season, and while peaches, considering the unusually large Eastern crop, have done fairly well, Bartlett pears, owing to an abnormal California crop of under-sized fruit, have done very poorly, have brought the growers little or no return, and have, more or less, depressed prices in the Eastern markets on other California fruits. More especially was this the case during the hot Eastern wave in August, which most seriously demoralized the fruit markets for many days, from which demoralization it was no easy matter for the market to recover.

Not least among the depressing causes for low prices is and has been the distressingly hard times throughout the East. Large numbers of mills and factories have been closed down for want of orders; thus throwing out of employment multitudes of fruit-consumers who were very glad to get along without fruit, if they could but get bread.

If, in the face of the depressing hard times, the large Eastern crops, the abnormal California pear crop, the unprecedented hot wave in August, there had also been divided auction houses in the different Eastern cities this year, thus perpetuating the California fruit war of last year, the results to the grower would have been still more distressing, if not utterly disastrous.

The method of selling California fruits in consolidated auction-rooms is now no longer an experiment, but an assured success, and there is every reason to believe that the growers and shippers will find it to their interest to continue to harmonize whatever differences may arise, with a view of perpetuating consolidated auction salesrooms free to all.

H. WEINSTOCK,
President California Fruit Growers and Shippers' Association.

CITRUS FRUIT EXCHANGES.

The successful methods of marketing citrus fruits in the southern part of the State are entirely due to coöperative associations or exchanges. The following review was prepared by special request by Col. T. H. B. Chamblin, who has been a prime mover in their organization, and to which we call special attention:

It cannot be denied that, speaking in general terms, the horticultural interests of California are in bad shape. The climatic and soil conditions are all that could be desired; the producers are, as a rule, energetic, enterprising, and intelligent; California products are in demand in most of the markets of the country. These general bad conditions to which we refer had their beginning prior to the panic. In no case can it be shown that they are the result of overproduction. The raisin industry, located as it is, practically, in the central part of the State, will serve to illustrate the whole. Statistics in this case show the production to be from ten to twenty millions of pounds short of the consumption of the United States and Canada. It has been stated, upon what is supposed to be good authority, that the crop of last season cost as much, or possibly more, to produce it than the growers received. To what can this be attributed? The more conservative and intelligent dealers in that product at the market end of the line attribute it wholly to the methods of marketing. They do not hesitate to say that proper control and distribution at this end of the line would correct the evil and enable them to obtain paying prices. In short, they declare that the difficulty lies in the lack of concert of action on the part of the growers. Actual occurrences in the markets, illustrating and confirming this proposition, might be given almost without number, if time and space would permit. This suggests organization among the growers. Where properly applied this has proven effective, but effective only to the extent that the growers have given loyal support to the organization. The producers of raisins and other industries have had organizations defective in character, and therefore failed. In the season of 1894, however, five small organized bodies of raisin-growers in the vicinity of Fresno came together in what is known as the exchange system of marketing. From the information at hand the result shows that the growers thus organized obtained a better average price than that obtained by the growers whose crops were handled under the methods as they usually obtain in the marketing of California products, viz., the commission system. This, too, in the face of the fact that only about 12% was under organized control. The importance of organization was so clearly demonstrated that six additional coöperative associations have been recently added to the number, making eleven in all united under the exchange system, and so located as to practically cover the raisin district. This was accomplished despite a strong counter movement headed by an incorporated consolidation of the speculators who had previously handled the product upon a commission basis. They presented a solid front with a capital stock of a million dollars, reinforced by strong local influences in their behalf; and thus equipped they set out to contest the field with coöperation. They claimed to have handled 80% of the crop the past season, and through these combined influences they sought to control a like proportion for the coming season. A lively campaign of two months by the contending forces demonstrated the fact that the growers could not be induced to repeat the experiences of the past with an open door of escape before them. Coöperation closed the campaign with the result as above stated, while the proposed combine went to pieces—were compelled to abandon the commission proposition, and cash offers were promptly made for raisins in the sweat-box at double and, in some cases, more than double the average price obtained under the commission system of the past year.

In the season of 1893 the orange industry of Southern California had practically reached the condition of the raisin industry as above outlined. While it might not be susceptible of practical demonstration that the industry was absolutely bankrupt, it is nevertheless true that values were rapidly depreciating and general discouragement prevailed among the growers, as the result of the haphazard and unbusinesslike methods of marketing the product. The prevailing conditions of depression gave rise to a universal cry for relief, and resulted in the organization of the Southern California Fruit Exchange, now so widely known and universally regarded as the hope of the citrus industry. As the result of its operations the downward tendency of values has been stayed, the commission business has suspended operations, actual purchase of the fruit at prices fixed by the Exchange has taken its place, and the business is restored to conditions of general prosperity and contentment.

All this argues not alone in favor of organization, but necessarily in favor of a specific kind. The exchange system seems to have met the conditions and overcome the evils, and would therefore seem to be entitled to the consideration of the growers of the State. Of this system, coöperation is the foundation, and centralization in marketing, under the direct supervision of the parties in interest, is the keystone. By grouping the growers representing each industry together under one head, and then grouping the whole under one system, separately and yet unitedly, the producers would be masters of the situation and the arbiters of their own destiny. They could command the markets; see that they were constantly and fully supplied with California products without glutting; avoid competition among themselves, and thereby secure the best possible results. We cannot here enter into a detailed outline of the system referred to, but submit whether the State Board of Horticulture could not well afford to inaugurate measures calculated to overcome the evils of the commission system as applied to the marketing of the products of the State, even though it be to the partial neglect of measures intended to eradicate other pests that prey upon her industries. We shall patiently await the decision of that body as to whether it be wise to neglect the one and pursue the other.

It may be said, however, that this does not come within the scope or duties of the State Board of Horticulture. If this be true, it is certainly not beyond their consideration and recommendation. What has been said concerning two of the vital industries of the State will apply with equal force to others as to conditions and remedy. When the present output and existing conditions are coupled with what confronts us as to production it does not require extraordinary foresight to forecast the result, unless something be done speedily to bring the marketing of our products to a systematic basis.

FREE PUBLIC MARKET.

The question of establishing in San Francisco a free public market for the sale of perishable products had been under discussion by several fruit associations, granges, etc. Numerous petitions were presented to the Board of State Harbor Commissioners asking for the setting aside of part of the waterfront for the establishment of a public wholesale market for perishable products, where any producer may sell or have sold his products by any agent of his choice. While the Harbor Commissioners signified their willingness to assign the necessary space and to coöperate in all ways possible, they required that the producers, through some organization of their own, have the detailed management of the market, subject, of course, to such regulations as the Commission may approve. No further action was taken until this Board considered the advisability of establishing said market and issued a call for a public convention of fruit-growers and others interested, to meet in San Francisco, April 16, 1896, to determine the question, and which convention was largely attended by representative fruit-growers, farmers, etc. After a thorough discussion, the following resolutions were adopted:

Resolved, By this convention of fruit-growers, and others interested in the sale of perishable products to the San Francisco markets, that we favor the concentration of the trade from first hands in products coming to San Francisco, at some suitable place upon the waterfront, in a free market under the jurisdiction of the Harbor Commissioners, and that in our judgment the following are essential features to the success of said market:

First—It must be the usual and ordinary terminus for perishable products of all transportation companies, at which all such products will be delivered, unless otherwise ordered by the shipper.

Second—The sale must be conducted under such regulations as shall insure to al shippers the opportunity to know, without expense to themselves, whenever they may so desire, the particulars of the disposal of their products.

Third—To accomplish this purpose there must be a competent inspection under the control either of the Harbor Commissioners or a State organization of producers.

Fourth—There must be the authority to levy upon all produce delivered to the market whatever additional tolls to those now paid, which may be required to defray the expense of proper supervision.

Whereas, The California Fruit Exchange having been recognized by special and regular annual conventions of fruit-growers as the authorized representative of the fruit-growers of California for all purposes connected with the marketing of fruits; and whereas, the said Exchange is, in our judgment, the proper body to inaugurate and conduct the proposed free market; therefore, be it

Resolved, That the California Fruit Exchange be and is hereby requested and authorized to immediately take up the subject of the inauguration of a free market for perishable products, and complete all necessary arrangements for its establishment and conduct on the lines indicated by this convention.

Resolved, That a committee of five be elected by this convention to confer with the Directors of the California Fruit Exchange for the purpose of securing representation on its Board, of producers of perishable products other than fruit, and we recommend suitable persons for those positions.

A committee of five was appointed, in accordance with the resolutions, who had the establishment of the proposed fruit market in charge, but afterward reported it could not, at this time, harmonize the conflicting interests, and the project therefore is still in charge of the committee, who it is expected will soon submit a plan of organization through which it is hoped the market may be established.

SHIPMENTS OF 1895.

The fruit output of the State in 1895 was cut short to a considerable extent by late frosts, but while some sections suffered considerably, others were not harmed, which accounts for the large bulk of the fruit they shipped through the season, as shown in the tables on fruit shipments, given below:

	1895.	
	By Rail.*	By Sea.*
	Carloads.	Carloads.
Fresh deciduous fruits	6,625.4	
Dried fruits	6,132.6	60.0
Raisins	4,538.5	4.8
Nuts	323.4	1,010.0
Canned fruits	3,129.5	
Citrus fruits	11,582.5	
Vegetables	3,613.6	40.0
Total carloads	36,045.5	1,114.8
Total by rail and sea		37,160.3.

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*Statistics collected by Gen. N. P. Chipman, in report to State Board of Trade.

The following table shows the total amount (in pounds) of orchard and vineyard products East-bound by the Southern Pacific Company* lines during the year 1895, from territories named:

Products.	San Francisco.	Oakland.	San José.	Stockton.	Sacramento.	Marysville.	Los Angeles.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Brandy	2,684,610	25,920	77,500	769,520	504,580	694,110	168,070
Wine	64,359,320	1,791,990	6,265,710	6,274,290	29,309,990	695,790	4,042,910
Canned fruit	23,071,670	5,906,990	11,976,340	257,720	10,362,800	7,056,820	2,888,700
Canned vegetables	498,720	305,320	283,080	400,170	153,230	24,000	60,910
Fruit, dried	9,184,020	690,130	8,196,300	12,767,770	8,797,780	6,522,670	5,935,530
Fruit, dried figs	51,620	1,930	1,060	1,211,820	29,530	12,360	3,680
Fruit, dried grapes	83,450	....	340	603,300	84,390	99,280	77,720
Fruit, dried prunes	2,268,910	633,920	43,549,800	2,280,460	7,261,180	1,055,250	2,394,260
Fruit, green (citrus)	45,930	....	....	1,185,250	328,770	1,157,500	94,167,180
Fruit, green (deciduous)	131,060	5,534,890	19,854,310	14,879,960	72,494,920	4,438,340	847,480
Raisins	907,720	100	23,930	84,133,610	1,385,860	441,090	1,303,960
Nuts	121,980	2,100	24,300	690	2,370	380	75,290
Nuts, almonds	829,850	121,690	244,750	86,690	557,080	659,240	64,250
Nuts, walnuts	97,320	300	100	23,410	890	210	1,772,150
Onions	564,940	....	23,150	1,209,880	848,280	48,230	497,740
Potatoes	6,770,750	32,500	1,346,690	1,081,660	6,506,660	616,330	3,061,980
Vegetables	8,673,050	....	73,230	204,810	3,373,660	252,150	7,586,040
Totals	120,344,920	15,047,780	91,940,590	127,371,010	142,001,970	23,773,750	124,947,850

*Table of shipments furnished by Mr. C. F. Smurr, General Freight Agent S. P. Co., to whom we are greatly indebted for same.

The following table shows the total amount of orchard and vineyard products East-bound by the Southern California Railway Company,* from territories named, for the year 1895, ending December 31:

Products.	Los Angeles County.	Orange County.	Riverside County.	San Bernardino County.	San Diego County.	Total.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Oranges	34,167,000	16,107,000	59,451,000	18,396,000	1,407,000	129,528,000
Lemons	1,344,000	378,000	483,000	1,953,000	1,071,000	5,229,000
Vegetables	20,746,000	5,236,000	726,000	682,000	242,000	27,632,000
Green and dried fruits	10,248,000	4,098,000	1,440,000	7,632,000	552,000	23,970,000
Raisins	----------	700,000	1,125,000	1,075,000	1,675,000	4,575,000
Honey	748,000	286,000	1,034,000	572,000	1,012,000	3,652,000
Grain	20,032,000	31,040,000	14,976,000	544,000	7,008,000	73,600,000
Wine	4,004,000	132,000	----------	1,452,000	154,000	5,742,000
Wool	480,000	705,000	450,000	----------	405,000	2,040,000
Totals	91,769,000	58,682,000	79,685,000	32,306,000	13,526,000	275,968,000

The North Pacific Coast Railroad Company† carried over their lines in 1895:

Butter	4,061,380 lbs.
Vegetables	4,266,213 lbs.
Fruit	1,556,868 lbs.
Total	9,884,461 lbs.

XII.

ZANTE CURRANTS.

CASE BEFORE UNITED STATES COURT—DECISION, ETC.

One of the most important cases affecting the raisin product of our State was brought before the United States District Court, to compel the importers of this raisin to pay the regular import duty, and was decided in accordance with the facts involved, much to the advantage of California raisin producers.

From the decision of the court the following points, as seem most directly interesting to our producers, are given:

The Points Involved.—The Collector of Customs claims that the currants in question are Zante currants, and that they are expressly included in paragraph 217 of the present Tariff Act, which reads as follows: "Plums, prunes, figs, raisins, and other dried grapes, including Zante currants, 1½ cents per pound." The importers contend that the currants are not Zante currants, but that they are provincial currants—that is, that they came from Patras, Greece, on the mainland, and not from the Island of Zante, and are covered by paragraph 489, which places on the free list, "Fruits, green, ripe, or dried, not especially provided for in this Act."

The Evidence Taken in New York.—The evidence now before the court for its consideration consists (1) of the testimony and exhibits introduced before the Board of General Appraisers and incorporated in their return to the order of this court of July 17, 1895, directing them to transmit the record of said matter and the evidence taken by them therein, together with a certified statement of the facts involved in the case and their decision thereon; (2) of the testimony and exhibits introduced in this court before the special referee in San Francisco.

Without entering into a minute consideration as to the effect and sufficiency of the evidence taken before the Board of General Appraisers at New York, it is sufficient to say that it is completely overcome by the evidence taken in this court before the referee. Eight witnesses were called by the protestant in New York. Several of them professed to have more or less knowledge concerning Zante currants, but none of them appeared to be experts. They certainly were not expert viticulturists or horticulturists, nor, so far as their testimony shows, had any of them made a special study of the Zante currant, or of currants in general. Several of them admitted that they were not experts and knew but little about Zante currants. Such knowledge as they did possess appears to have been acquired in the course of dealing in dried fruits and by reason of importations made of currants, and while sufficient for the ordinary purposes of trade, it cannot be said to be sufficiently competent to be accepted as binding expert testimony.

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* Furnished by Mr. C. B. Whitehead, Auditor Southern California Railway Co., whose aid we acknowledge with thanks.

† We are indebted for these figures to Mr. W. F. Russell, General Freight Agent.

Four of the witnesses identified a sample of the importation as being, not a Zante currant, but a Patras currant from the mainland. Four other witnesses testified that the expression "Zante currants" was understood to mean currants from the Island of Zante alone, and not from the mainland. All these witnesses were subjected to little, if any, cross-examination. One witness in the course of his examination stated that a Zante or Patras currant was a fruit other than a grape. This was clearly an error, and is completely and conclusively overcome and refuted by the unanimous testimony of all the witnesses, both for the Government and for the importers, who testified in court before the referee.

The Evidence Taken in San Francisco.—The testimony taken before the referee is in marked contrast to that given before the Board at New York. The witnesses, on the part of the Government—some twenty-three in number—were experts in every sense of the word, and proved themselves thoroughly conversant with the Zante currant, not only botanically, but commercially as well. Some of them testified that they had made experiments in the growing of Zante currants in this State. They were subjected to a rigid cross-examination. The protestant produced but three witnesses, one of whom was the importer, and all of whom displayed a conspicuous want of knowledge upon the subject. Such opinions cannot stand as against the positive statements of the experts in the case, who have made the question one of actual study, observation, and experiment. It would prolong this opinion to an unwarrantable length to rehearse the testimony given. It predominates largely to the effect that "Zante currants" is a well-known commercial expression among importers, dealers, and growers of raisins, and relates to and comprehends a kind of raisin made from a small, seedless grape grown not only in the Island of Zante, but also, and to a much greater extent, on the mainland of Greece and other neighboring localities. "Zante currants" is simply its English name. It derives the name of "currants" from the fact that, in times past, it was shipped from the City of Corinth, Greece.

Findings of Fact.—The court went into a lengthy discussion of the origin of the term "Zante currant," the growth of the Zante currant trade and present status of the trade, and its significance commercially. He concludes on this point: "Without going further into the evidence, it is enough to say that, as a whole, the following four propositions of fact were, to my mind, conclusively established: First, that the currants, comprising the importation in question, of which 'exhibit 1' is a sample, are Zante currants; second, that Zante currants are a kind of raisins; third, that Zante currants are grapes dried; and fourth, that Zante currants are not the product exclusively of the Island of Zante, but they are produced also on the mainland of Greece, in the archipelago and other places, and in much larger quantities than on the island. Being Zante currants, they come within the language of paragraph 217, as above set forth, and are subject to the duty of 1½ cents per pound therein prescribed."

The court discussed at considerable length the claim of counsel for the importers that the use of the word "Zante" indicates that Congress meant to limit the imposition of the duty on currants produced only in the Island of Zante, and that, as the importation involved in this case came originally from Patras, in Greece, on the mainland, and is a product of the provinces of Greece, therefore it is not subject to the duty imposed by paragraph 217, but, on the contrary, it is entitled to free entry, under paragraph 489, which exempts from duty "fruits, green, ripe, or dried, not especially provided for in this Act."

All Greek Currants Are Zante Currants.—The Court shows by the citation of numerous authorities that, in interpreting a name or expression applied to articles upon which duties of importation are laid, it is well settled that Congress uses such terms in their ordinary commercial sense rather than in their distinctive or technical sense. He continues:

"The Tariff Act, in the enacting clause, applies to 'all articles imported from foreign countries.' As a matter of fact, the evidence tended to show that much larger quantities of Zante currants, so called, are grown and exported from the provinces of Greece than from the Island of Zante, and that those grown on the mainland are still known commercially in this country as Zante currants. In other words, 'Zante currants' is the generic, commercial term for this species of grape when dried into raisins. It would be unreasonable to suppose that Congress, in imposing duties on Zante currants in the general language employed, intended to tax those coming from the Island of Zante alone, and not those which come in much larger quantities from other localities. Such an interpretation would result in an unfair and unwarranted discrimination between foreign places of produce, which, in the absence of clear and unambiguous words to the contrary, should not be imputed to Congress. It is but fair to assume that, had it intended to limit the imposition of import duties on Zante currants grown and exported from that island only, it would have so stated in clear and plain language."

In conclusion, the Court says: "My opinion is that the classification of the article imported and involved in this case as 'Zante currants,' made by the Collector of the Port of San Francisco, is correct, and that it is therefore subject to the duty prescribed in paragraph 217, of 1½ cents per pound. The opposite decision reached by the Board of General Appraisers is erroneous and should be reversed, and it is so ordered."

An Eight-Year-Old Walnut Tree.
From the seed; being the age seedling walnut trees begin to bear.

XIII.

CALIFORNIA WALNUT INDUSTRY.

(1) COMMERCIAL IMPORTANCE.

Holding a prominent place among the fruit products of California, stands the walnut. This position has been attained in the past few years and is due to the results of experience—and many failures—which have shown the proper conditions under which this fruit will thrive, its requirements in soil, climate, and location, and the production of varieties adapted to the peculiarities of our State. The old-time saying that the area of walnut culture in the State "is very limited" and confined to any particular section, has, by happy chance, proved a fallacy, and is disproved by the numerous productive orchards that bear witness to its successful culture. While the early plantings were made in the southern counties, where the culture of the walnut is pursued with great magnitude, the industry is gradually spreading and broadening. While the walnut will withstand a very low temperature, it is very susceptible to sudden changes, and a hot day suddenly following a frosty night will chill the young wood, and often proves fatal to a young orchard, setting it back a season's growth. The same is true in the springtime on the opening of the flowers or catkins—a chill will frequently cause them all to drop and render the crop a failure. For this reason a location free from prevailing frosts, or one where the sun will not strike the trees until the effects of the cold have been overcome, is very desirable. The latter trouble can be largely overcome by planting some of the late blooming varieties, which do not send forth their catkins until danger from frosts is largely past.

California walnuts are fast supplanting those from foreign countries. Only a few years ago the growers of these nuts here had a very hard struggle to introduce them, being obliged to accept the humiliating price of from 3 to 6 cents a pound less than that paid for imported walnuts. Gradually, however, a reduction came, in favor of the California product, and now Eastern dealers will take our best walnuts at prices equal to, and in many cases exceeding, those obtained for those coming from abroad. Our State affords a splendid field for the walnut industry, and although thousands of trees have been planted and the acreage is being extended every year, it is believed that overproduction need not be feared. Our producers have all America for a market, and they are not slow to appreciate the advantages of their position.

(2) THE "ENGLISH" OR "PERSIAN" WALNUT.

The walnut (*Juglans*[*] *regia*, Linn.) is a native of Persia, and is supposed to have been introduced into our State by the Franciscan monks during the establishment of the California Missions in 1769. Records of its early history are scant, but mention is made of walnut trees growing about the Missions by most of the writers in the "Record of the Founding of Missions," and the "History of Franciscan Missions of California," and, therefore, it is safe to assume that with the advent of the Missions dates the introduction of this valuable tree. In the Mission yards are yet to be seen walnut trees of those early plantings, and while age began to tell on these many years ago, they still live and bear nuts, but few in number and small in size.

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[*] *Juglans* is a genus of trees consisting of six species; three are natives of the United States, viz.: *J. nigra*, or black walnut; *J. cinerea*, or butternut, and *J. fraxinifolia*, or ash-leaf walnut. The other three species are *J. regia*, "English" or "Persian" walnut; *J. pterocarpa* grows on Mount Caucasus, and *J. baccenta* in Jamaica and Spain.

*"When I first arrived in Los Angeles, in December, 1854, there were numerous small bearing 'English' walnut orchards and sundry isolated *large* trees which could not have been less than ten years old, and some of which must, I am confident, have been more than twenty-five (25) years old.

"In talking to-day with Mr. Stephen C. Foster, he fully corroborates my view, that the English walnut was first brought to Los Angeles, or to California, by the Missionary Fathers, or by individual laymen during the missionary era. Mr. Foster says that when he came here, in 1847, there were several large English walnut trees here, that he is certain were not less than twenty years old. One of these was on the old Pryor place, on Alameda Street, which I remember well, and another on the old Louis Vigne property, etc., which would make their planting extend back to 1827, or before. So that I think it would, without doubt, be historically true to say that the cultivation of the so-called 'English' walnut was commenced in California as early as the first quarter of this century (and possibly still earlier) by the Mission Fathers, or under their patronage and encouragement.

"It would have been a very easy and natural thing to do, for persons coming here by sea to have brought a few walnuts, and for the Friars to have planted some of them. What could have been more natural than for the priests or other officials, civil or military, who came from Spain, to desire to raise, in this fertile country and mild climate, all those useful fruits and food products that they were familiar with in their native land? We are all compelled to admire the practical forethought of the organizers of even the very first expedition in 1769, Galvez, Serra, etc., in this respect."

The most careful research as to the early walnut plantings has been made, showing that among the first walnut orchards of early history, planted outside of the Missions, were those of the late Col. J. J. Warner, in San Diego (supposed to have been planted in 1843, on a ranch named after him and which name it still bears—"Warner's Ranch"), the Pryor, Vigne, Wolfskill, Dalton, Boyle, Shaw, Childs, and Briswalter orchards at Los Angeles, the Temple orchard at La Merced Ranch in the San Gabriel Valley, the Heath orchard at Carpinteria, and the Wilson and Kewen orchards at San Gabriel. A small planting was made in 1846, near Calistoga, by Frank E. Kellogg, Sr. The largest of these plantings are the Heath, Briswalter, and Temple orchards. The Briswalter is of most recent planting; the Heath orchard is the largest in the State of early history. It is impossible to ascertain the exact years these orchards were planted, as all the persons above mentioned (excepting Mr. Heath) have since passed away. These orchards are said to have been set out from 1850 to 1865; however, the only authoritative information I can find is the statements of several persons, whose minds are not clear as to the exact time.

†"In 1858, the year I obtained my walnut seed of Mr. Wolfskill, of Los Angeles, I had no knowledge of walnuts being planted in this State, except those planted by the Mission Fathers. The trees from which my seed was taken were planted by the Franciscan Fathers. The Wolfskill place, in Los Angeles, was an old garden of the Mission. Mrs. Wolfskill was a native Spanish lady of Los Angeles, and informed me that the vineyard and walnuts were bearing when she was a small child, in fact she did not know the age, they were large trees. Judging from the oldest trees I have at present, I think those walnut trees must have been over fifty years old in 1858. I made inquiry for walnut trees with the view of purchasing, and could not find any one who had tried their culture except the Mission Fathers. I was advised to plant walnuts by Reverend Father Gonzalez, head of the Franciscan Missions, who resided for many years in Santa Barbara. From him I obtained much of its history taken from documents in his possession. The

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* Letter from H. D. Barrows, a pioneer, February 29, 1896.

† Letter from Hon. Russell Heath, of Carpinteria, February 27, 1896.

nuts were brought from Spain, first planted in Mexico, and taken from there to South America. The first planting in California was at San Diego; two at San Gabriel, Los Angeles County, three in Los Angeles. From my information, I think the Wolfskill place was one of the first planted in what is now the City of Los Angeles. After the Mission at Santa Barbara was established, there was a propagating garden established and seeds and plants brought from the Mission south. Father Gonzalez told me no walnuts were planted, but almonds were, but they were not considered a success and were abandoned, while the olive, grape, fig, pomegranate, and some other fruits were cultivated with great success. There was no record of the walnut having been planted north of the Mission of San Buenaventura, where I saw for the first time a walnut tree in 1852."

[*]"Father never spoke to me of the 'English' walnut orchard that was set out; but speaking to Don Ramon Valenzuela, who was in father's service in 1849, he said that in that year he plowed the orchard, and that then a few of the trees were commencing to bear. As you know how long it takes the trees to bear,[†] you can judge how old they were at the time. Don Miguel Pryor had just one walnut tree older than ours, but father was the only owner of an orchard at the said time."

[‡]"I think Mr. Wolfskill's orchard (now dug up and land turned into streets and building lots) had been planted at least ten years at date of my arrival here, last of 1854, and Mr. Elijah Moulton is of the same opinion. Mr. Coronel, Colonel Warner, and Governor Pico would probably have known, but all three of them have died within the past two years. The Andre Briswalter walnut orchard of 1,000 trees must have been planted, I think, as early as the 60's, if not in the late 50's. J. R. Barton, Sheriff, had planted a walnut orchard on his ranch at Los Nietos River before he was killed by the bandits in January, 1857."

In almost every county of the State are found large walnut trees showing great age, planted very irregularly among other trees, indicating that no attempt had been made to produce a walnut orchard by itself, but were planted by the growers to experiment as to their growth and to furnish walnuts for the table.

At Knight's Ferry, Stanislaus County, is a seedling walnut tree of enormous size, the property of Asa Collins, planted by W. E. Stewart in 1858. The seed was brought from France by a French sailor. Out of the three walnuts he brought only one grew, which is the parent tree of many plantings.

[§]"In 1873, Mr. Finch, of Alameda, ordered from Messrs. Rose & Grant, of Topeka, Kansas, fifty trees of a so-called 'Persian' walnut, introduced by them from Persia, one year old, which sold for $10 each. The order could not be filled, so he only obtained thirty-six, of which Mr. Latham bought ten, Mr. Selby two, J. D. Roberts four, and Wm. Meek twelve. The sale of the balance was withheld."

[¶]"Mr. D. C. Vestal has a walnut tree at San José, about sixty feet high, bearing medium thin-shelled nuts. The nuts from which this tree was produced came from Chile, and were planted about thirty years ago by Mr. Vestal, where the tree now stands. He has gathered from it yearly about a barrel of nuts."

In 1883, Mr. Kelsey, of Fresno, reported to the State Horticultural Society that he had at Fresno two trees of the so-called "English" walnut, that were then about six feet in circumference and about fifty feet high.

[‖]"At Mud Springs, El Dorado County, are to be seen several large 'English' walnut trees."

In Winters, Solano County, at the John Wolfskill place on Putah Creek, are many large trees that yearly produce medium-size nuts of fair quality; these, however, were grafted on the black walnut, and are about thirty years old.

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[*] J. W. Wolfskill, letter of March 13, 1896.

[†] Trees of this so-called "English" walnut come into bearing at the eighth year from the planting of the seed; therefore, the orchard must have been set out about in 1841.

[‡] H. D. Barrows, letter of March 14, 1896.

[§] Pacific Rural Press, 1873, p. 193.

[¶] Proceedings State Horticultural Society, April 27, 1883.

[‖] Pacific Rural Press, 1871, p. 460.

*"My father, F. E. Kellogg, settled in Napa Valley about midway between the present towns of St. Helena and Calistoga, in 1846. In 1848 he planted some walnuts in his nursery. When the trees were two years old (in 1850) he planted them about his dooryard (ten or twelve in number), where some of them remained for more than forty years. From time to time, father added to the number of his walnut trees, but never planted a very large orchard of them. Some of the trees in my orchard here in Santa Barbara County are from nuts taken from the old trees in Napa Valley."

The largest walnut orchard of early planting in the northern part of the State is located near Los Gatos, in Santa Clara County; it is about thirty years old, and produces fair crops yearly. The largest orchards of recent planting are in Lake and Sonoma counties. In San Lorenzo, on the Wm. Meek estate, is an extensive walnut orchard of early planting. In Sonoma, at the Vallejo place, and at Mission San José, are many walnut trees that show great age and are healthy in appearance. General Bidwell, at Chico, has a considerable number of walnut trees, all vigorous and fruitful. Many such trees are to be found in Napa, San José, Santa Clara, Merced, Modesto, Fresno, and Visalia. Along the coast in almost every county are to be seen large walnut trees of early planting. While these early plantings were small and many consisted of isolated trees, as were those in the Mission gardens, yet those trees mark a special epoch in the horticultural history of our State, as they have proved the great longevity of the walnut and enlightened the growers as to their culture and future possibilities.

(3) LONGEVITY OF THE WALNUT.

The great and prodigious age attained by the walnut can only be conceived from records of its early history. All the early botanical writers—English, French, Italian—point out the fact that the walnut, in their respective provinces, does not bear until it has reached the age of fifteen to twenty-four years, and hardly becomes a paying investment until it attains a prodigious age. In California, the walnut begins to bear at the eighth year from the seed, and from that time on the crop increases, and the orchards become remunerative. It is now not uncommon to see walnut orchards from thirty to forty years old, in the prime of health, producing every year bountiful crops.

† "In Persia, the tree comes into bearing at eight years from the planting of the seed; in Italy, Spain, and the Island of Madeira, in about sixteen years; in France—the southern part—in eighteen years; in England, in twenty-four years, and in California in eight years, the same as in Persia. So, I take it, the southern part of this State is nearest its home."

‡ "After fifteen or twenty years from the time of planting, the walnut gives only hopes, so to speak, for its yield is yet so small that its value can hardly be reckoned; it is only from thirty to sixty years that this tree can offer each year a product sufficient to increase the income of the landlord. It takes a century, and over, before the wood is good to be used in the arts."

§ "Walnut trees are spoken of that bear, in good years, 50,000 to 100,000 nuts; such trees are truly very rare, and their trunks are not less than 15 to 20 feet in circumference."

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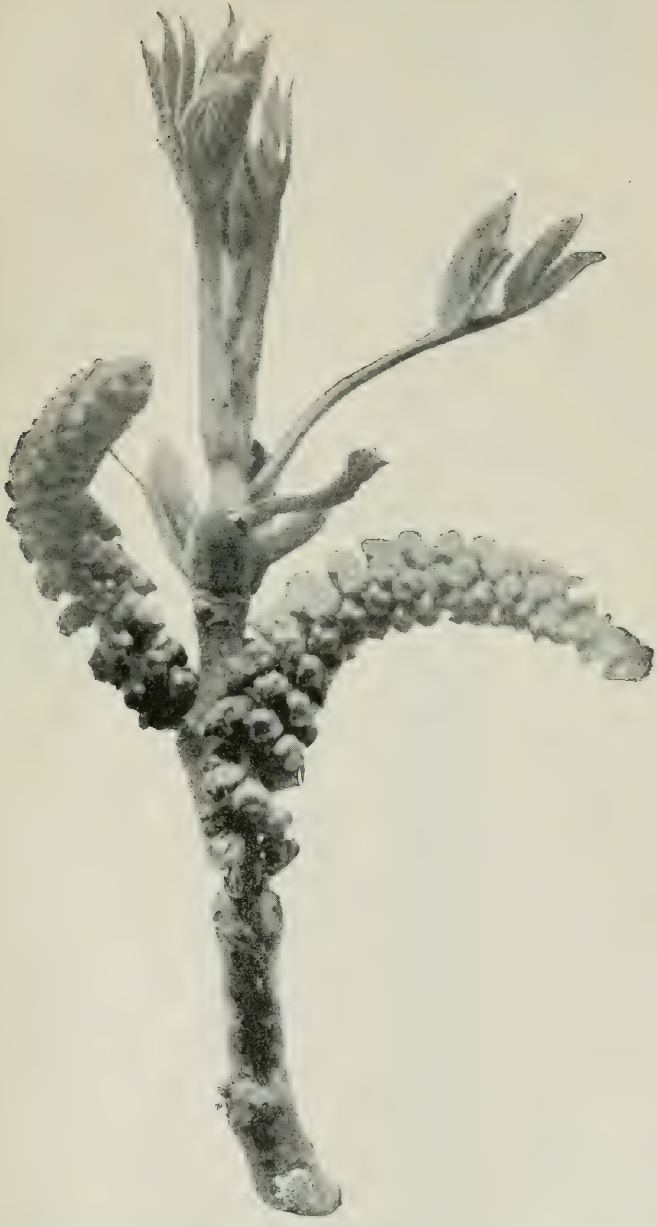
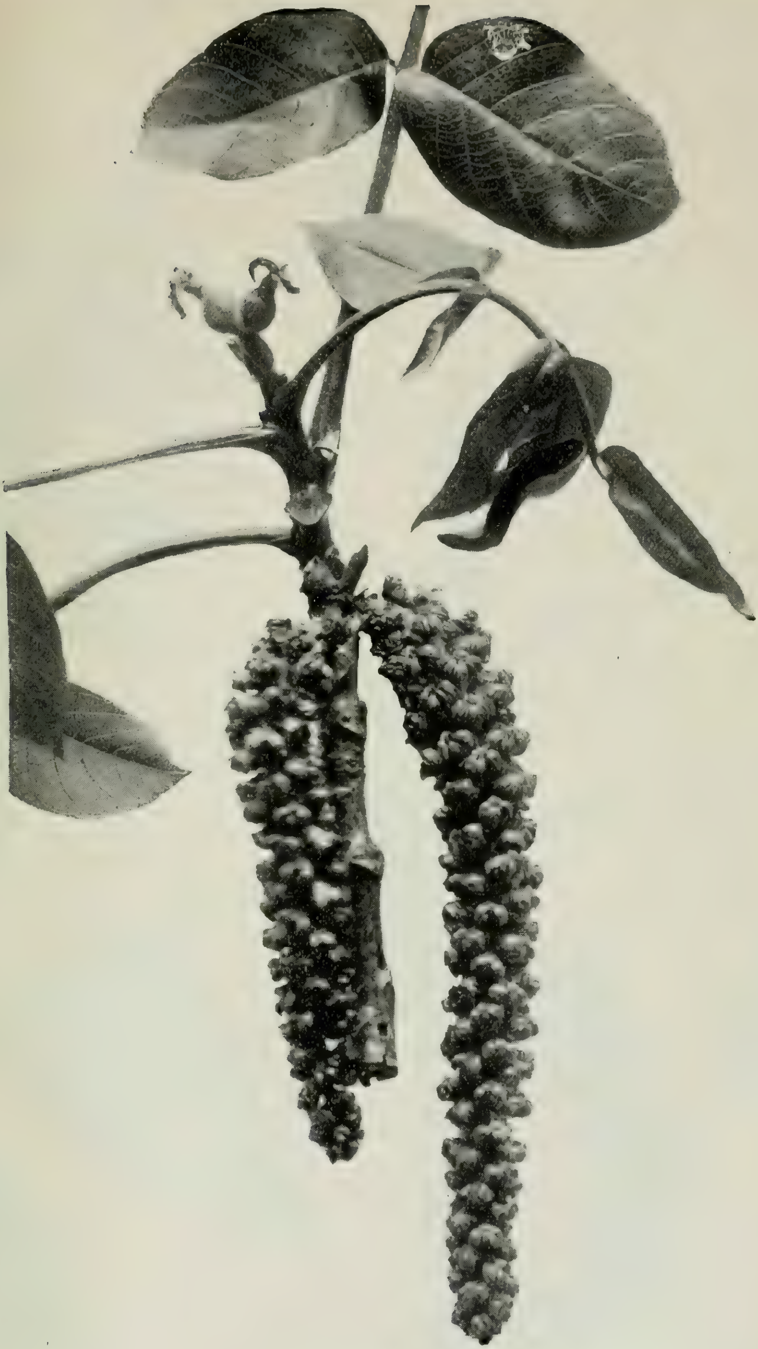
* Frank E. Kellogg, of Goleta, letter of March 12, 1896.
† Hon. Russell Heath, in essay before Eleventh State Fruit-Growers' Convention, 1889.
‡ Maison Rustique, Vol. 2, Chapter XII.
§ Maison Rustique, Vol. 2, p. 143.



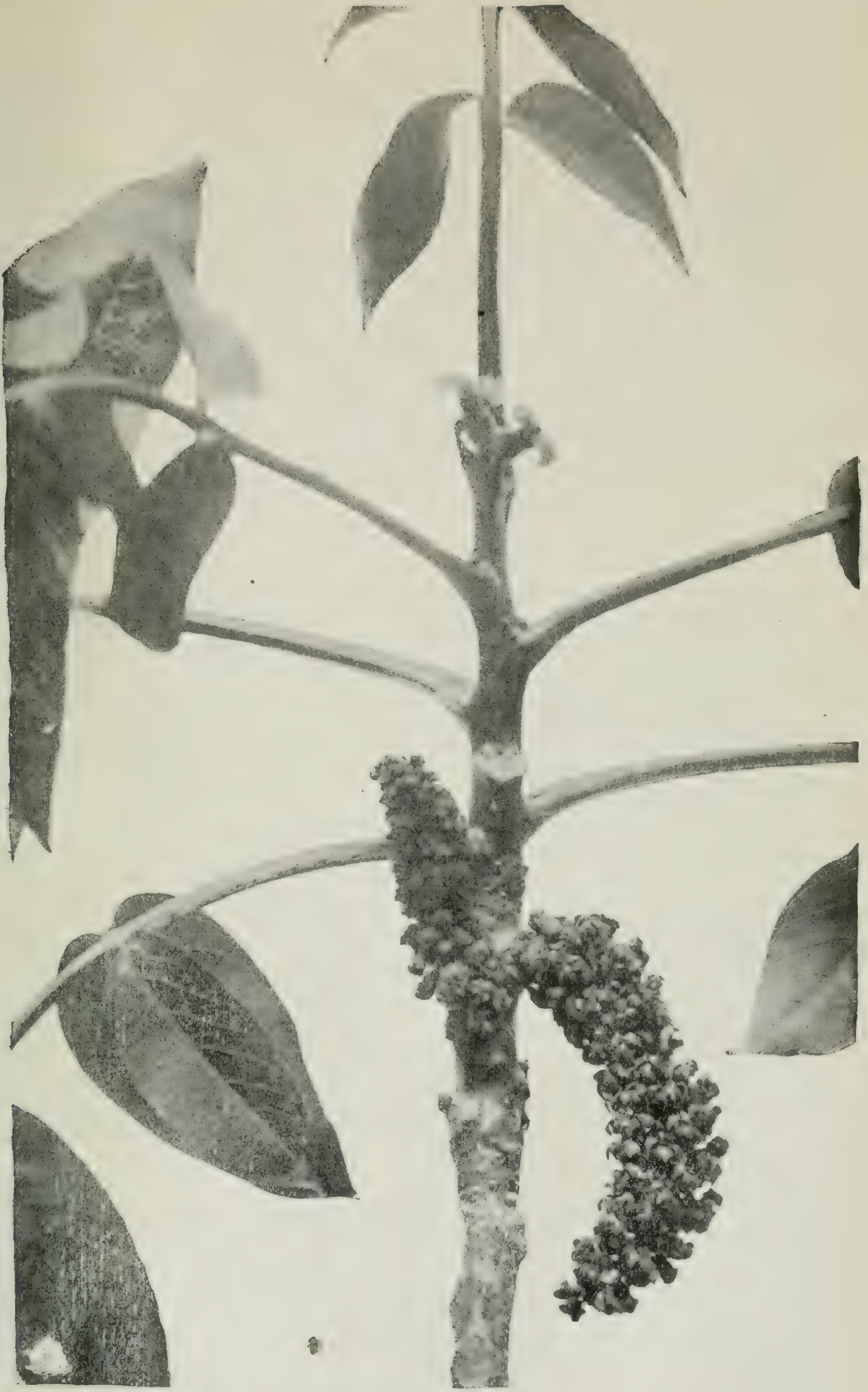
Walnut Branch.

Showing development of male flowers, or staminate catkins, with the first period of growth two weeks before the appearance of the female flowers or pistillates.



WALNUT BRANCH.

Showing both staminate or male catkins and pistillates or female flowers in full bloom, having appeared together, or nearly so. The male organs or catkins emanate from the bud-cells in the axils of the leaves on twigs of the preceding summer, and the female flowers at the terminals of the new growth, with the embryo nuts.



WALNUT BRANCH.

Showing male flowers or staminate catkins after blooming, and the female flowers or pistillates (and embryo nuts) above, just in bloom, having made their appearance two weeks later, and ready for fertilization.

*"In the village of Beachemwell, in Norfolk, may be seen a walnut tree (*Juglans regia*) which spreads its 'softly swelling hills' of leaves over the church-yard of All Saints Church, now in ruin, as if it sought to mingle leafy dust and human ashes. When this tree is arrayed in all its honors 'fresh and green' it is an object interesting by its symmetry and gigantic proportions. The crumbling walls of the ruin, throwing their shadow far away and standing out in gray relief from the green turf, beneath which the good forefathers of the village sleep in peace, offer a striking contrast to the huge mass of walnut foliage, presenting a specimen of its kind seldom equaled. This tree has produced in one season 54,000 nuts, and its dimensions are as follows: Circumference of the body of the tree near the ground, 32 feet; height of trunk, 10 feet; the circumference of the five large branches is 16 feet, 14 feet, 9 feet, 8 feet, 8 feet; the circumference of the extreme spread of the tree is 120 yards, and its estimated height is 90 feet."

†"On the road from Martel to Gramat (Lot) is to be seen a colossal walnut tree at least three hundred years old. The height of this tree is about 55 feet; its branches extend to a distance of 125 feet; the trunk, 14 feet in diameter, is only 20 feet high, but it sends out seven immense branches. It bears on an average each year 15 bags of walnuts."

‡"An Italian architect mentions having seen at St. Nicholas, in Lorraine, a single plank of the wood of the walnut, 25 feet wide, upon which the Emperor Frederick III had given a sumptuous banquet. In the Baidar Valley, near Balaklava, in the Crimea, stands a walnut tree at least 1,000 years old. It yields annually from 80,000 to 100,000 nuts, and belongs to five Tartar families, who share its product equally."

(4) POLLINATION.

Until recent years no attempt was made to improve the varieties of the walnut in cultivation by cross-pollination, but the universal practice has been to plant the nuts selected from fruitful and rapidly growing trees, and the seedlings grown therefrom, on not becoming regular bearers, were dug up, as were also all trees producing inferior nuts. Trees producing nuts deficient in kernels were not uncommon, but were frequently reported, and many such trees still exist. From past experience it is readily to be seen how important it is for the grower to study and know the varieties, so as to plant and locate them in the orchard so that they may assist in the pollination of one another. In fact, the study of pollination becomes essential as the first step to successful fruit culture.

In all catkin-bearing trees—as the walnut—or of monœcious flowers, the flowers necessarily differ and have their sexes separated, but are borne by the same tree. The incoherent pollen is produced by the male flowers (pendulous green cylindrical catkins), which is distributed and comes in contact with the female flowers by the aid of insects, the air and wind, by fall of gravity, or by friction, thus insuring a crop. The male flowers, or staminate catkins, are the first to appear, and come out generally together with the first growth of the tree, although in many instances they appear before the trees put forth, but about the time they begin to show signs of growth. The female blossoms, or pistillates, appear much later, from one to three weeks intervening. In some of the European varieties the difference is very slight, the pistillates appearing about the time the staminates are in full bloom. Instances of this nature with the "English" walnut are very rare.

The male flowers, or staminate catkins, after blooming lose hold and drop, and, coming in contact with the limbs, thus distribute their pollen amongst the foliage of the trees. The pollen is also distributed and

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*Gardener's Chronicle, London, 1857, p. 694.
†Gardener's Chronicle, London, 1852, p. 568.
‡Gardener's Chronicle, London, Vol. VII, 1877, p. 310.

adheres to the limbs and leaves during the blooming period of the male catkins. The fertilizing power of the pollen is not lost, but is preserved for an indefinite period, and a mere speck falling on the stigma of the female blossom is ample to render it fertile.

In many instances it has been observed that some trees will produce at times an abundance of flowers of one sex, and few or none of the other sex. Trees—as the walnut—that mature their pollen before the female flowers on the same tree are ready for fertilization, are called by botanists *proterandrous;* while others, called *proterogynous*, have their stigmas mature before the pollen is ready. The purpose of this curious functional difference obviously is in favor of cross-fertilization, by pollen, of flowers borne by other trees of the same species.

According to the Gardener's Chronicle, in 1888, reports became current of trees in portions of the walnut sections of France bearing a full crop, but the nuts failed to harden, the husks when about half grown withering up, and few good nuts were found. The kernels which were formed were soft and insipid. Reports made throughout were that "while there were plenty of nuts there was nothing in them," and after assigning different reasons for this failure, conclude "probably from imperfect fertilization of the flowers." Many other similar instances are reported as occurring in different groves.

> *"It is a common occurrence for the walnut to be deficient in producing either the male or female blossoms, which it bears, both of which are essential to its producing and ripening nuts. I have a tree, now about twenty years old, which began a few years ago to show blossoms, but those merely female, without one male catkin appearing on the tree, and the consequence has been that after the flowers faded the fruit regularly dropped off. This season, there being a considerable show of female blossoms but no male ones, I thought of trying the plan followed by gardeners in the case of melons and other fruits where fertilization is not freely effected by nature, and having seen abundance of male catkins on a tree at a friend's, I asked him to send me some, and he accordingly sent me a small paper-bag full, which I dusted and threw over such of the female blossoms as were within my reach. The consequence has been that I now have about a dozen fine nuts, swelling out regularly, with every appearance of coming in due time into maturity. All the embryo fruit not fertilized have fallen off as usual. I am pleased with the success of my experiment, and mean, should my tree still prove deficient in male blossoms, with the assistance of my friend's, to supply its wants, and, by taking a little more trouble, I have no doubt I shall be able to render every female blossom fruitful."

As showing this curious functional difference in our own State, a few facts are cited. A nurseryman at Ventura observed a large seedling walnut tree, which, from its luxuriant growth and symmetrical form, he believed would be a variety worthy of cultivation. Accordingly, in the spring of 1886, he planted forty pounds of nuts gathered from that tree. When the seedlings bore, none of them produced nuts of any commercial value. This, of course, proved to be a sad disappointment to him, and, after waiting ten years for a crop, he dug up most of them. Some of the trees had become of large dimensions and had long, spreading branches, and were always quite full of nuts, but without kernels—all hull and shell. This functional difference was investigated; the trees were found to produce an abundance of flowers of the same sex, but few or none of the other, through which imperfect fertilization of the flowers the kernels in the nuts did not form—they were wanting. It is also interesting to note that no attempt was made to correct this curious phenomenon by artificial cross-pollination, by distributing pollen from staminate catkins, or male flowers, of other trees, before digging up the trees.

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*Gardener's Chronicle, London, 1847, p. 541.

Through the continuous planting of the seed (as mentioned elsewhere), without regard to the laws of nature, has come about the degeneration of the species in many sections. Trees are frequently reported as having "never borne nuts"; others "bloom profusely, but are blooms of only one sex; the nuts have never set, and have become a barren waste." This is a summary of the reports that have been continuously received for years past. In recent years more attention has been paid to the morphology of the walnut, and it is now better understood.

*"I have a few trees of the ordinary 'English' walnut. In 1878 the staminate blossoms came out in the latter part of March; they dropped off and perished on the ground. About the 15th of April the pistillates made their appearance. The result was the nuts dropped off. The next year the staminates made their appearance the 1st of April; they dropped off by the 10th, and between the 12th and the 15th the pistillates made their first appearance. The result was I had no walnuts. The next year, 1880, I found that the blossoming period came closer together, within a few days. About the 1st of April the staminate blossoms dropped off, and in a few days the pistillates began to make their appearance. I looked over the trees and found a few stunted staminate blossoms. I gathered them very carefully, and shook them over the trees. The result was that every tree over which I distributed the pollen was laden with walnuts."

Incidentally, I may mention that almond-growers were in a worse predicament, and in many sections the culture of the almond was abandoned. The Languedoc, a variety first introduced, was found to produce an extraordinarily large number of flowers of one sex, and few of the other. The morphology of the almond was studied, with wonderful results, and many of these same localities are again planted to the almond, and are among the leading almond-growing sections of the State. It was also found that by planting different varieties in an orchard alternately, the pollen would intermix and aid in the setting of the fruit. This, however, was done in many cases without studying their blooming period, and consequently failure resulted. For instance, seedling trees of the bitter almond were planted in the orchard, as they were profuse bloomers, but the time of blooming was not considered. Seedling trees of the bitter almond are among the first to bloom, and put forth two weeks or more ahead of the standard varieties, so that when the latter came into bloom the pollen of the bitter almond had either been washed off by the early rains, or lost through other unfavorable conditions, preventing its action on the other flowers. In order to accomplish the results aimed at, the varieties so intermixed must bloom together, or nearly so. I know of no instance where this has been tried on the walnut, but it is certainly worthy of trial, as it may tend to correct this curious phenomenon, prevalent among some of our walnut orchards complained of, consisting of trees grown from seed. Of course, with the almond the experiment was much easier, because, after testing a certain variety, and its merits becoming fully known, they were reproduced by budding. The long period required by the walnut to come into bearing was a bar to any experiments in this line, and it was grown from the seed almost altogether. But this is no longer so. Fruit culture has reached the height of perfection, and is now being conducted on broad lines and scientific principles. Inferior seedlings are giving way to grafted and budded trees of the choicest kinds, or to seedlings of choice selection; their habits are studied, and the novice or the grower does not have to wait and undergo years of toil and anxiety to acquire

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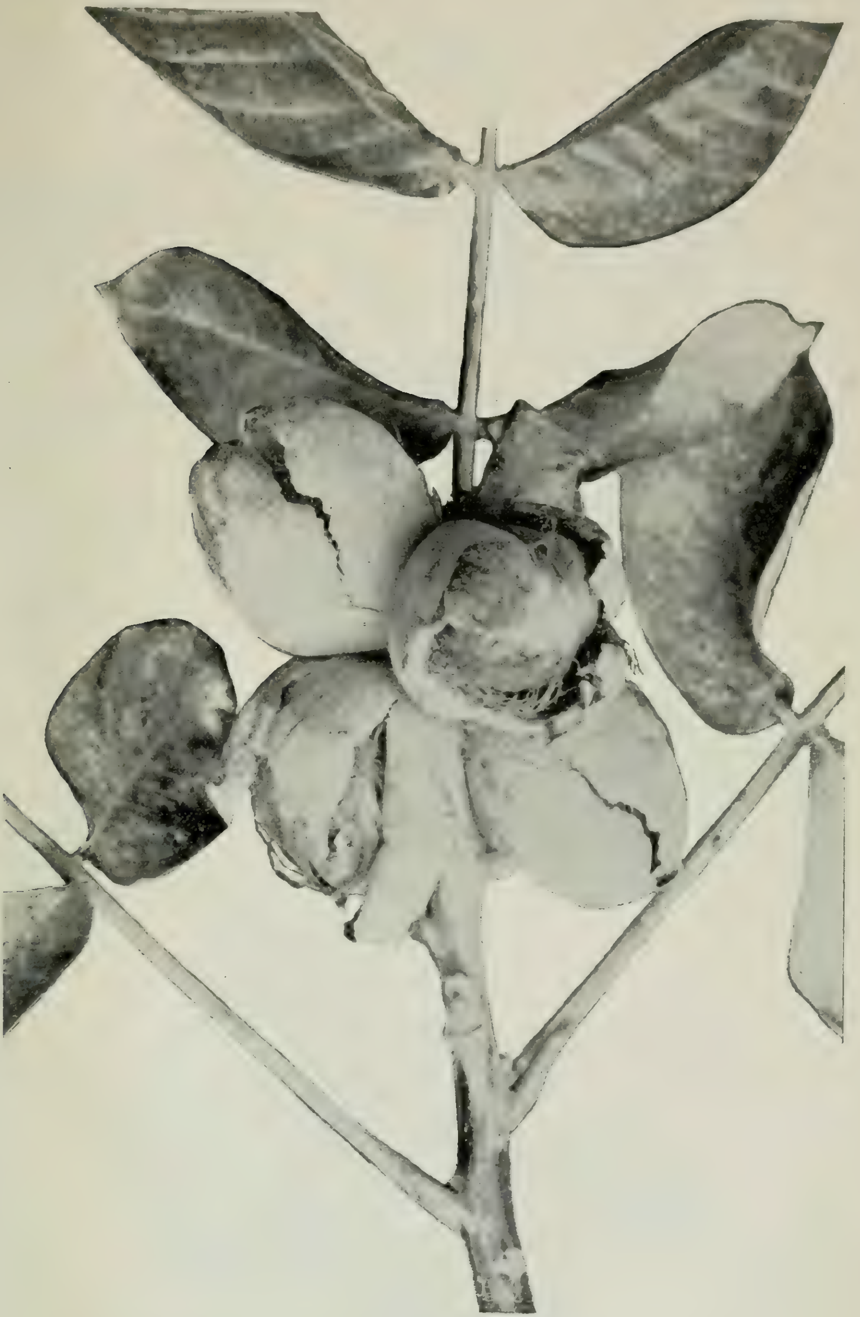
*W. H. Jessup, of Haywards, in essay read before State Horticultural Society, April 27, 1883.

results, but can profit by the experience of others who have made fruit culture the study of their lives, and who show their liberality and warmheartedness by sharing this knowledge with their neighbors.

(5) ORIGIN OF IMPROVED HOME VARIETIES.

While large walnut orchards were set out, and many new plantings made every season, consisting mainly of seedling trees produced from seed from the old historic trees of early introduction, no attempt was ever made to produce improved varieties by cross-pollination, and none are yet recorded. Only recently have improved varieties become known, and these originated from chance seedlings. In 1867, Mr. Joseph Sexton, of Goleta, Santa Barbara County, purchased in San Francisco a sack of walnuts supposed to have come from South America, labeled "English walnuts," from which he raised about 1,000 trees, and the spring following (1868) planted 200 of these trees in orchard form at Goleta. Sixty proved to be of a soft-shell variety. Later, he planted 24 trees raised from soft-shell nuts from his original trees; of this number 21 came true (the same) to the parent tree, and 3 made a much stronger growth, commenced fruiting in the sixth year, and produced a soft-shell nut, and an improvement over the original trees. The first he named "Santa Barbara Soft-Shell," and the latter "Improved Soft-Shell," by which names they are now known. In 1859, Hon. Russell Heath, of Carpinteria, furnished Mr. Stowe, at Santa Barbara, with a large quantity of walnuts from his orchard of so-called "English" walnuts, for planting. Among the trees that Mr. Stowe raised from that seed, one produced soft-shell nuts. It is Mr. Heath's firm belief that this nut must have come from a chance seedling produced by him from seed which he procured from the orchard of the late Wm. Wolfskill, at Los Angeles, from whom he obtained his first seed. There is no instance on record where any soft-shell walnuts had been produced prior to that time.

Mr. George W. Ford, of Santa Ana, originated soft-shell walnuts, which he christened "Ford's Eureka" and "Ford's Improved Soft-Shell." They were produced from seed grown by Mr. Sexton, of Goleta. Mr. Felix Gillet has originated the "California Paper-Shell," the "Columbus," the "Cluster Prœparturiens," and the "Mayette-Shaped Prœparturiens." Many other varieties have been catalogued, mostly because they were "new," but were never passed upon by any competent authority, or their merits determined. Most of these trees, on coming into bearing, produced a nut similar to that of the tree from which they originated as chance seedlings. These various types, not being distinctive enough to be classified by themselves, are all labeled "English walnuts."



WALNUT BRANCH.
Showing the mature nuts through the cracking of the husks, ready for harvesting.

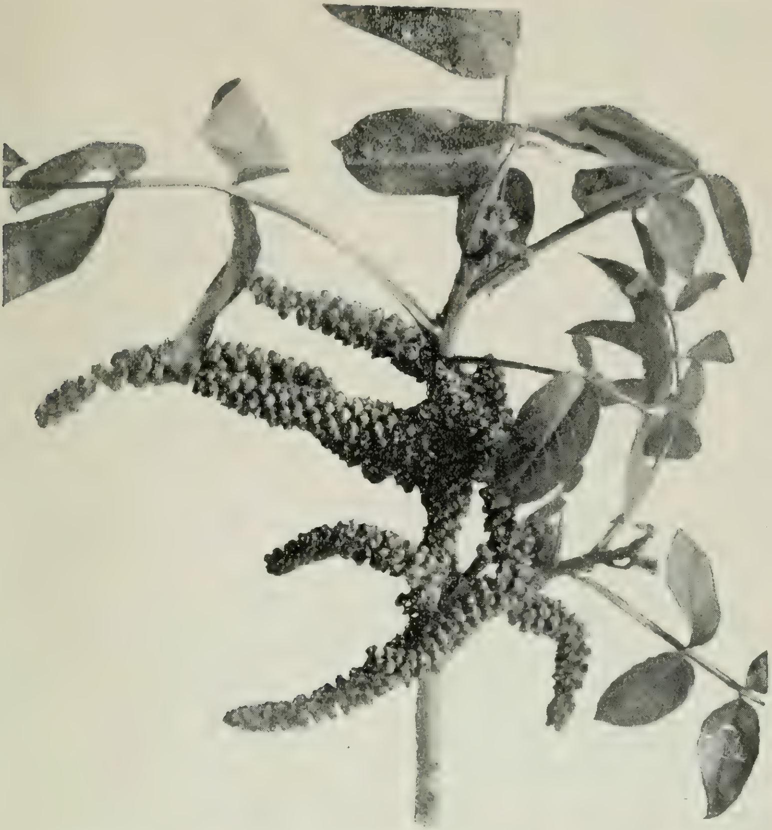


FIG. 1.—Branch of walnut showing character of growth and an extraordinarily large amount of male, or staminate, catkins; reduced.

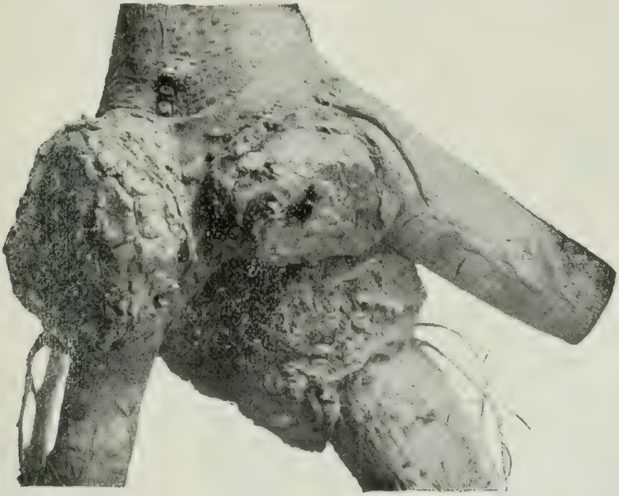


FIG. 2.—"Root knot" on young walnut.

(6) VARIETIES OF THE WALNUT (*Juglans regia*, Linn.).

ENGLISH.*

(Plate XXI, Fig. 2.)

Synonyms: Madeira, Naples, Los Angeles, Common, Chile, Mission, etc.

This walnut was the first introduced into our State; from it innumerable varieties have sprung, and of which the principal orchards of the State consist. The name is applied to any variety of the so-called "English" walnut. It would be difficult to determine the particular variety to which this name belongs; however, it is a name applied by common consent to any and all varieties that have originated from the so-called "English" walnut, and really is more of a commercial name through which the product is marketed.

The principal orchards of the State consist of trees grown from seed of the so-called "English" walnut, and while the walnut comes truer to seed than most fruits, it could not be claimed that *all* the orchards of the State are of this particular variety, simply because the trees were raised from seed of the original stock. In almost every orchard of the State of early planting are trees bearing nuts wholly unlike the nuts produced by the parent trees, and they can only be classified as types of the original nut, showing the great variation produced from planting the seed. Many of these orchards, however, consist of types of rare quality, such as the orchards in the Los Nietos Valley, Santa Ana Valley, San Gabriel Valley, Carpinteria, Santa Barbara, etc. While most of the types that originated from the seed grown on trees of early planting produced a hard-shell nut, there were many that produced a thin or soft-shell nut. The best and most productive orchards to-day consist of trees grown from seed of the original trees.

To describe the so-called "English" variety would be as difficult as to describe the seedling orange and its many types. Oranges cultivated from seed are known as "seedlings," but as the seed from these seedlings has been planted continuously, and though the trees so produced bear fruit so distinct and so variable, they are only *seedlings* from *seedlings*, and are accepted under that name without regard to variety.

Among those trees of early history were many that produced large, clear, hard-shell nuts, which were greatly sought in the market. The nuts of this type were in great demand for planting, although by continuous propagation from the seed for nearly a half century, without regard to the degeneration of the species, many of these types have been allowed to degenerate until their cultivation has been almost abandoned.

While seedling trees and small orchards of this so-called "English" walnut, or "Los Angeles nut," are met with in almost every county of the State, the successful culture of this nut and its many varieties has been confined to the lower counties—from Santa Barbara to San Diego. Trees grown from seed of this nut—"English"—in many sections have proved too tender to withstand the cold of winter and the heat of summer.

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* For want of a better name, and to indicate the locality from whence it came (as it is supposed by all the earliest British botanical writers to have first been introduced into England by the Romans), it was called commercially the "English walnut."

They generally get cut back by frosts† in the spring, as they put forth too early to escape them. The trees keep growing quite late in the season, and the tender shoots and undeveloped growth suffer from the extreme heat, and are nipped by the frost in the fall.

Of late years several late-blooming varieties produced by chance have come into prominence, having most of the essential qualities required, and which are proving successful everywhere, and will hereafter, no doubt, supplant all others of this species.

While the walnut has reproduced itself, that is, "come the same," from seed, it has a tendency to revert to the wild state, as is the case with all trees when continuously propagated from seed. A variety can only be reproduced and remain constant by budding and grafting. In this State many such instances have been cited and recorded.

EUROPEAN VARIETIES.

The varieties described in this chapter have proved most promising of the numerous kinds introduced into our State in recent years. The descriptions given are by leading growers, whose opinions are worthy of fullest consideration:

Persian.—Generic commercial name, applied by common consent to all varieties of the *Juglans regia.*

* *Chaberte.*—(Plate XXII, Fig. 9).—An old and most valuable variety; late in budding out. The nut is well shaped, roundish-oval, and of fair size; the kernel is of extra fine quality; good bearer. The Chaberte originated in France over a century ago, by a man named Chaberte, hence its name.

"The Chaberte is a good and thrifty variety."—West.

"The tree is very productive, developing its leaves and bloom *late* in the spring."—Rock.

* *Franquette* (Plate XXI, Fig. 5).—Blooms late in spring. Originated about the same time as the Mayette, in the southeast of France, by a man named Franquet. It is quite large, of an elongated oval, and very attractive; kernel full-fleshed and sweet, and of rich, nutty flavor. It also buds out late in the spring, being as hardy as Parisienne and Mayette. Very desirable as a market nut.

"Nuts very large and long; one of the finest for dessert."—Rock.

* *Mayette* (Plate XXI, Fig. 3).—This is one of the finest dessert and market nuts grown; it is quite large and uniformly so, well shaped, with a light-colored shell; the kernel is full-fleshed, sweet, and nutty. But what renders this valuable kind more valuable yet, is that it is very hardy, being late in budding out, which enables it to escape uninjured the disastrous effects of late frosts in the spring; it is also an abundant bearer. This is the nut imported into the United States under the name of Grenoble, but on account of duties to pay, and the nut being high-

priced in its home in France, a common and cheaper grade is often mixed with it, to the disgust of nut importers in New York and Chicago. The Mayette was originated by a man of the name of Mayet, one hundred and thirty years ago, having ever since been a great favorite as a market nut.

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* Described by Mr. Felix Gillet.

† On March 2, 1896, the northern and central portions of the State were visited by a severe frost and snowstorm. On the morning of the 3d I examined the growth of the English walnut in several orchards, which had already grown about 4 to 6 inches, and found much damage done to both the growth and the male catkins. The European varieties did not show any signs of starting. On March 15th the pistillates of the 'English" walnut made their first appearance, but all the male flowers, or staminate catkins, had dropped off. On March 22d the European varieties began to put forth. As a consequence there was no crop of "English" walnuts, but the European varieties set well.

"My trees did not produce until the sixth year. They are a large, excellent nut."—West.

"One of the finest dessert nuts grown; large, full-fleshed, and sweet. Very late in budding, thereby escaping injury from late frosts."—Rock.

**Mesange.*—This nut has a very thin shell, and derives its name of Mesange from a little lark of that name that goes to the kernel through the tender and thin shell; very productive. This may be regarded as a first-class family nut, but I would not recommend it as a market nut, on account of its rather small size and thinness of shell.

* *Vourey.*—This new and valuable variety of recent introduction originated near Vourey, France, hence its name. The nut has the shape of the Mayette, but is more round and smaller; the shell is thin, light colored, and smooth, and the kernel exceedingly sweet and nutty; very hardy.

"The nuts are very large and the shell well filled with a sweet, rich kernel. The leaves and flowers are produced late."—Rock.

Grenoble (Plate XXII, Fig. 5).

**Meylan.*—A new and very attractive variety, originated near the little village of Meylan, in the walnut district of France. The nut is of fair size; the smoothest one of our collection, very thin shell, and of excellent quality; buds out late.

**Serotina* (*St. John*) (Plate XXII, Fig. 3).—I find this variety not to be so late in budding out as to not be sometimes injured by late frosts in the spring. The nut is of medium size, well shaped, with a very sweet, nutty meat; enormously productive.

"This variety came into bearing the fifth year from planting. It is of less value than others grown by me. Its flavor is not quite so delicate, and the shell a trifle harder, but as it is a week later in showing leaf in the spring, it will suit frosty localities."—West.

"Leaves and flowers of this variety are not developed until all danger of frost has passed; very productive."—Rock.

Mobart (Plate XXII, Fig. 2).

* *Vilmorin, or Cross-Bred.*—This curious variety was obtained by "hybridizing" years ago, in France. It is a cross between the English walnut and the Eastern Black walnut, and was called Vilmorin after the leading member of the well-known seed firm of Vilmorin, Andrieux & Co., of Paris. The nut is small, and has the shape of the English walnut, but the furrows of the Black walnut; it is darker than the English and lighter than the Black. It can hardly be called an improvement on the Black walnut; surely it is not on the English. It is a very odd sort, having no commercial value whatever. We have fruited this cross-bred walnut for the last seven years, and find that either as a family or market nut this cross-bred variety is entirely worthless. It must be regarded and propagated, therefore, simply as an ornamental variety.

**Weeping Walnut.*—A new and very curious kind of walnut, highly ornamental, the branches drooping down like those of the weeping-willow. We have had limbs on some of our weeping walnuts growing to eight feet through the summer, drooping straight down, with the ends dragging on the ground, and even trailing on it to a length of twelve to twenty inches. The nut is of fair size, oblong, thin-shelled, and of good quality. It looks to be a very abundant bearer.

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* Described by Mr. Felix Gillet.

Rivera Hard-Shell (Plate XXII, Fig. 7).

Rivera Soft-Shell (Plate XXI, Fig. 8).

**Laciniated, or Ash-Leaved.*—The foliage of this kind of walnut is so delicate, so finely cut up, that it makes of it a most graceful ornamental tree, worthy to be planted conspicuously in the garden or front yard. The nut, besides, is exceedingly pretty, of fair size, round, with a very smooth shell and sweet kernel. The tree is claimed to be an abundant bearer.

**Parisienne.*—Large, excellent, starts late in spring. This beautiful nut, also one of the finest for dessert and market, was originated in the southeast of France, and not in the neighborhood of Paris, as its name would imply; its beauty made it called *Parisienne*, in honor of the capital of France. The nut is large, broader at the small end than the Mayette and Franquette, and has a very pretty shape. It is as late as the Mayette, and as desirable for market.

"A most beautiful nut; one of the largest and best for dessert, broad and large, with full-fleshed kernel. Bears early and regular."—Rock.

**Alpine, or Wonder of the Alps.*—A new and very rare variety originated not long ago in the Alps Mountains, in France. Next to the Mammoth it is the largest walnut grown on my place. Though the shell looks a kind of rough, it is perfectly soft and thin, and the meat sweet and filling well the shell.

**Lanfray.*—A newly originated variety. Very pretty nut, oval in shape, of fair size and first quality.

**Poorman.*—A new kind, of recent introduction.

Fertile (Plate XXII, Fig. 1).

**Præparturiens or Fertile, First Generation.*—This variety was introduced into the State by me, in the winter of 1870–71, and in my grounds, 2,600 feet up in the Sierra, are the first trees of that kind that ever produced fruit in this State. Described as follows: The Præparturiens was originated in France, in 1828; from the fact that it first bore nuts while being but two years old, the Latin name of Præparturiens was given to it from *Parturiens*, bearing, *Præ*, before—bearing before the usual time. It was also called Fertile, on account of its surprising fertility. The nut is small, though thin-shelled, and very sweet; it is this nut that produces "Second Generation" trees.

**Præparturiens or Fertile, Second Generation.*—The Second Generation Præparturiens, the kind we recommend to plant, has retained all the characteristics of the original, only the nuts are much larger, and larger, too, than those of the third and fourth generations, seventy-five per cent of the trees bearing nuts from medium to large, and twenty-five per cent from small to medium, and of all sorts of shapes—all, however, being thin-shelled and of first quality. The Præparturiens is one of the most productive kinds, and bears heavy crops from the start, and it may be regarded as the best variety of walnut to plant for family use; the largest Præparturiens nuts, though, being well marketable.

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*Described by Mr. Felix Gillet.

***Third Generation Prœparturiens.*—The kind mostly sold in California under the generic name of Prœparturiens, and grown from nuts borne on Second Generation trees. The nut is generally small—too small for market, but of first quality.

***Mammoth Prœparturiens.*—A large-fruited variety of Prœparturiens, originated in France. The nut is extraordinarily large; soft shell, and with a full-fleshed kernel.

Prœparturiens (Plate XXII, Fig. 8).—"This variety has proved exceedingly satisfactory. It will bear in nursery rows when not more than four feet high, and continue to have a crop every year, and has never been injured by spring frosts. On my place are seedlings of the second and third generations, which still convey their fertile and early-bearing qualities. The nuts on mature trees are of good size and of the best quality."—West.

Gant (Syn. *Bijou*) (Plate XXII, Fig. 4).—"Nuts very large, twice or three times larger than the common walnut, and sometimes square or oblong in shape."—Rock.

"The Bijou is the largest walnut known. This variety began to bear when it had been planted four years, and has constantly increased its yield. In 1890 it bore a large crop, and in 1891 it set its fruit so quickly that I thought best to remove at least one third of it. The reputation of this tree in its home—France—is that of a shy bearer. The quality is excellent, superior to anything I have seen."—West.

***Mammoth, or Jauge.*—This is an immense nut, the largest yet originated. So large is the shell of some of them that "ladies' companions" are made out of the shells by fancy-goods manufacturers wherein to stow away gloves and handkerchiefs. The nut, though of such large dimensions, has a thin shell, and the kernel is of first quality.

***Cluster* (*Juglans Racemosa*) (Plate XXI, Fig. 7).—This remarkable kind of walnut, introduced some twenty years ago into this country, is a worthy rival of the Prœparturiens for productiveness, but superior for the beauty of the nuts. It derives its name of *Juglans racemosa* from the Latin word *racemosus*, meaning abundant in clusters, full of clusters, which is the main characteristic of that most beautiful variety. The nuts, when the tree is in full bearing, grow in long clusters of 10, 15, and even 25 to 28 nuts. The Cluster, like the Prœparturiens, reproduces itself well enough from the seed, *provided* that the nuts be gathered from trees *grafted from the original.* The nut is thin-shelled, of fair size, hermetically closed, with a smooth, white shell; in fact, a perfect beauty.

***Barthere.*—"A singularly shaped nut, elongated, broad at the center, and tapering at both ends; the shell is harder than that of other sorts."

Kaghazi.—Of doubtful origin; grown about Niles, in Alameda County.

Grand Noblesse.—Described, in "Nut Culture in the United States," as having originated by L. L. Bequette, of Los Nietos, but is very little known by the growers of that section.

VARIETIES OF HOME ORIGIN.

The chapter on pollination of the walnut illustrates how varieties originate by accident, or from chance seedlings. The following varieties originated in that way; they have been fully tried and their merits have become known, and are therefore entitled to be placed among the list of varieties worthy of cultivation:

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*Described by Mr. Felix Gillet.

**California Paper-Shell* (Plate XXI, Fig. 1).—Originated by Mr. Felix Gillet. A nut borne on a grafted Chaberte, the tree being, therefore, a Second Generation Chaberte. The nut is only of medium size; shell very thin and almost white; kernel full-fleshed, exceedingly sweet and nutty.

**Columbus.*—Originated by Mr. Gillet. Produced from a Second Generation Mayette. The nut is very large, exceedingly pretty, roundish, with smooth, light-colored shell, and kernel of first quality. Named Columbus in honor of the World's Fair in 1893, the year that my second trees of that kind went into bearing.

**Mayette-Shaped Prœparturiens.*—Originated by Mr. Gillet, some twenty-five years ago. A large nut, sitting on its end like the Mayette, hence its name. Full-fleshed kernel of first quality; heavy bearer. Solely propagated by grafting.

**Cluster Prœparturiens.*—A variety of Prœparturiens said to be very fine, also originated by Mr. Gillet. Nut large, oblong, smooth surface, perfect soft-shell; kernel fine and sweet. Growing in clusters.

Soft-Shell.—Originated from seed, by Mr. Joseph Sexton, of Goleta, Santa Barbara County, in 1868. The seed he procured in San Francisco, which was labeled "English," and was supposed to have been imported from Central America. Mr. Sexton describes this variety thus: "Nut looks very much like the imported Chile walnut, having the shape and color. The objection to this variety is that as the trees grow older the nuts grow smaller—diminish in size—and are not as salable as larger nuts."

Improved Soft-Shell (*Santa Barbara Soft-Shell*) (Plate XXI, Fig. 10).—Originated by Mr. Joseph Sexton, of Goleta, Santa Barbara County, in 1870, from seed of the "Soft-shell," crossed with the hard-shell or "English" walnut. The nut in outer appearance resembles the "English" or hard-shell, but the shell is as thin as the "Soft-shell," and the kernel or "meat" is a beautiful white color. Tree productive, uniform, and symmetrical in growth.

Ford's Improved Soft-Shell (Plate XXI, Fig. 6).—Originated in 1877 by Mr. George W. Ford, of Santa Ana, from seed he obtained in San Francisco, and supposed to have come from Mr. Joseph Sexton, of Santa Barbara. Out of the twenty-five pounds of walnuts he obtained, one hundred of the largest and finest nuts were picked out, and from these twenty large nuts selected. These were planted, and from which originated this "new" improved nut. The nut resembles the "Soft-shell." It is a large, clear nut, separates easily; the meat is very white, and the tree is a handsome grower.

Ford's Eureka (Plate XXII, Fig. 6).—Originated by Mr. George W. Ford, of Santa Ana, from soft-shell nuts procured from Mr. Joseph Sexton, of Goleta. The nut is almost round, meat white, and very fine. Tree vigorous, and a fine grower.

ORIENTAL VARIETIES.

Among the most beautiful trees are the Japanese walnuts. Two varieties are known in this State, one (*J. Sieboldiana*) being grown for more than twenty years. While it has been grown successfully, its economic importance has not as yet been determined. The nuts differ greatly from the varieties of *J. regia*, and present curious forms; they are, nevertheless, valuable, for the kernel is oily and sweet. The tree is very handsome, requires no pruning, is a strong grower, and very symmetrical in form, which, with its large, glossy leaves, of extraordinary size, render it most beautiful and especially suited for roadways and avenues. The tree is also valuable for stocks, as they "take" easily and are always healthy and of thrifty growth.

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*Described by Mr. Felix Gillet

Japanese (*Juglans Sieboldiana, Maxim*) (Plate XXI, Fig. 4).—This variety has been cultivated very successfully in this State for more than twenty years. It is a beautiful ornamental tree, indigenous to Japan. The leaves are of enormous size. The nut is small and elongated, quite hard, but with a sweet kernel; of very little commercial importance.

Heart-Shaped (*Juglans Cordiformis, Maxim*).—This variety is also indigenous to Japan, and of recent introduction. The tree is similar in appearance to *J. Sieboldiana*. The nut is small and "heart-shaped," with a sweet kernel, said to be easily extracted by boiling for five minutes and then cracking.

Chinese (*Juglans Mandshurica, Maxim*).—This nut is also of recent introduction, and is indigenous to eastern Asia. Resembles closely the Eastern butternut in habit of growth and foliage, and is said to resemble it in the form and appearance of the nut.

(7) PLANTING, SOIL, AND OTHER REQUIREMENTS.

There is considerable difference of opinion among growers as to the proper age to plant walnut trees in orchard. Many contend that trees of three years' growth are best, while others contend that the seed should be planted where the tree is intended to grow, that it should never be transplanted, as in doing so certain roots, and especially the tap-root, have to be cut, which is detrimental to the growth and fruiting qualities of the tree. Others hold this practice to be a fallacy, and contend that the tree should be grown in the nursery until the sixth or eighth year, as is practiced in some countries.

*"I commenced transplanting trees in my nursery at one year old; each year I renewed my nursery rows, planting each year so as to enable me to have trees for my own land, which I was obliged to clear in order to prepare it for the orchard. I planted after the first year, and after the second year, and continued planting year by year, from these different nurseries of different ages. When I arrived at the ninth year of planting, my trees had then been in bearing one year in the nursery. The trees that I planted out one year will bear fruit the seventh year. Eight years is as soon as I ever had them bear in my orchard from the seed. My experiments proved that the first or second year is an unnatural time to transplant the walnut. Why? There are two periods that the walnut ought not to be transplanted, that is, the second and after the fifth year; the root starts the second year and makes a partial growth, and then it divides itself between top and root. The walnut will start and grow in root the first year without starting at the top, until it has made a certain period of growth, and then the root grows if not forced. I can force a walnut and make it grow ten feet the second year, but I say that is an unnatural growth and it ought not to be indulged in. The second year I say, then, is dangerous; it is the period between the top and the root, and when you take it up you destroy that growth. The third year it makes top alone, comparatively no root; it is then that your little tree, twelve inches high, grows up to the height of six to twelve feet. It is the top that it is making that year, and of course you do not desire to transplant a tree that is all to top and not to root, because when you take it from the nursery rows you must allow that tree to go down and make the root first, before it can make the top. After the third year you can transplant it with safety. Why? It has made

its top. The fourth year its tendency is to root and not to top, because the fourth year it makes its spurs two inches on the side of that growth of the third year. The tendency of that year is all root, and if you want to transplant a young tree, then take up your three-year-old tree and transplant it and you will get your fruit then as quickly as the age of the tree will allow it to bear. After the fifth year, their tendency is not to make root; then is the time when those little branches two inches long send out the long arms to the distance of seven or eight feet; then it is that your tender shoots, especially in exposed conditions, are liable to be cut upon the end by the frost; then it is, if you are in the interior, that one hot blast will kill the ends of your trees, because it will have vigorous growth growing after the fifth year, and about the sixth, and the only remedy is the knife, because then the tree is touched by either cold or heat.

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*Hon. Russell Heath, of Carpinteria. (Remarks apply to varieties of the "English" walnut, hard and medium shell nuts.)

"Transplanting walnut trees, my experience is that I never had a nut from my trees that I transplanted from one year old to seven, without waiting six years. The best success I have had, and which plan I have followed, has been when I have transplanted trees in orchard form after they had passed the age of bearing in my nursery rows. I transplanted eight hundred eleven-year-old trees and did not lose one in transplanting. It does not cost much to cultivate trees for such a period in the nursery—a thousand can be cultivated in a day—and if they were in orchard the expense would be very great; and while the cost of transplanting trees at this age is probably ten times more than for three-year-old trees, you save more than ten times that amount in the cost and care through those years while in orchard."

* "I have raised trees from the seed and transplanted all the way from a year old up to six; and while they have grown and done well, I prefer to move them at three years of age, or about that time. The best trees that I have were transplanted at three years old."

† "I want one-year-old walnut trees one to three feet, two-year-olds four to six feet, and three-year-olds seven to nine feet, all of the above to be good stocky trees. The root of a three-year-old walnut is but a little longer than a one-year-old, though it is certainly larger. Of course, the root will grow in proportion to the top of the tree, for when a walnut commences to branch—which is about four years from the seed—then the root will commence to throw out laterals."

‡ "The usual custom is to set out two-year-old trees. In setting out young trees they should be inclined toward the coast or prevailing winds, and in trimming always try to keep them in that position. By using these precautions, and insisting on having the tap-root left at least three feet long when the trees are dug in the nursery, you will be likely to have your orchard in good shape when it is grown."

§ "The best aged tree to plant is two years old; not that I think the age makes any difference, but the trees at that age are of a size that they can be seen, and run no risk of getting damaged while being cultivated. In careful hands, I believe one-year-old trees as good or better, and perhaps it would be better still to plant the seed where you want the orchard trees to grow, but if planted in this way great care must be taken for two years in cultivating, that they do not get trodden down and the tops broken off, which makes the orchard uneven and unsightly. When planting two-year-old or larger trees, they should be selected, planting the largest trees first, and keep on doing so until the orchard is finished. By so doing you can get trees of equal size together. Some say it will not do to plant the seed where you want the tree to grow, that it must be transplanted, and the tap-root cut to make it fruit. I have tested this claim and found it a fallacy, and find that nuts planted alongside of one-year-old trees have produced prolific crops, and are larger trees than those one year older."

¶ "The plan of propagation is to plant the nut in nursery form in the spring of the year, in well-cultivated, sandy loam, about six inches deep. The first year they will grow from six inches to one foot high; the second, from one and a half to three feet; the third, from five to six feet. At this period it is considered the best for transplanting to permanent sites."

The walnut does best on a moist, warm, sandy loam, well underdrained. It is a very vigorous grower, and requires ample root room, vertically and horizontally, and unless this is furnished the tree will not do well. Soil, therefore, which has a hardpan near the surface, heavy clays, or soils which hold too much moisture, are to be avoided. A fairly light, friable loam, of good depth and easily worked, offers perfect conditions in the matter of soil for the walnut.

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* O. N. Cadwell, of Carpinteria. (Also refers to varieties of the "English" walnut, or hard-shell nut.)

† George W. Ford, of Santa Ana. (Remarks apply to improved varieties on the "English" walnut, or soft-shell nuts.)

‡ A. Dorman, of Rivera, with reference to hard, medium, and soft-shell nuts.

§ Joseph Sexton, of Goleta, with reference to improved varieties of the "English" walnut, or soft-shell nuts.

¶ Hon. Ellwood Cooper, of Santa Barbara, with reference to varieties of the "English" walnut, or hard and medium-shell nuts.

At a recent convention of walnut-growers, the consensus of opinion as to the best soil for the walnut was in favor of a rich, deep, sandy loam, affording good drainage, and from 16 to 18 feet to surface water. This, however, met with opposition from some growers, who claimed to have attained equally good results with walnuts growing in soils principally adobe and with copious irrigation. It was also claimed that a rich alluvial soil, with a slight mixture of adobe, with water about from 15 to 20 feet from the surface, was one of the best and strongest soils for the walnut. Mr. Ford, of Santa Ana, has some twenty-year-old walnut trees very thrifty and bearing heavy crops every year, in land where the surface water is only 3 feet below; but time can only determine how long they will thrive under such conditions.

[*] "The walnut should be planted for profit and best results on deep, rich loam, with no hardpan, stiff clay, or impenetrable soil nearer than 12 feet. I would select locations naturally moist in preference to land requiring irrigation. A temperature of 60° to 80° in summer, I regard as more favorable than other localities, although they thrive and are profitable in much hotter places."

[†] "In this part of the State (San Joaquin County), the walnut requires a deep, rich soil, one in which the roots will strike deep, so that there can be no pinch in the hot summer months."

Mr. West has grown the "English" walnut and various French varieties for over twenty years. No irrigation is practiced by him, and unless the walnut finds the conditions mentioned, it is subject to a sudden check of the flow of sap during the summer, which has frequently occurred. The leaves fall and the nuts are left exposed to the hot rays of the sun, and invariably sunburn.

[‡] "In planting trees in orchard, first of all plow the ground deep and then go over it with a harrow or pulverizer. Forty feet apart, giving twenty-seven trees to the acre, is the best distance to plant the Improved Soft-Shell walnut. Dig large and deep holes; plant 2 or 3 inches deeper than the trees grew in the nursery; lean them to the prevailing summer winds, and you will not have to stake your trees to make them grow straight. Press the soil firmly around the roots, and if not very moist, give each tree about ten gallons of water, which is sufficient to settle the soil around the roots. Cultivate your orchard to the depth of 5 or 6 inches. If your soil is moist enough to keep the trees in good growing condition during the summer months, irrigation is unnecessary, but to make a first-class walnut, in size and fullness of kernel, if the ground is not naturally moist enough, irrigation will have to be adopted. Small grain should not be planted in a walnut or any other orchard. If corn is grown, leave 8 feet on each side of your trees clear, though I am of the opinion that potatoes, peanuts, or beans are less injurious to the trees."

[§] "The usual custom has been, until the last few years, to set two-year-old trees 40 feet apart each way, and plant corn among them as long as it would make a paying crop; experience, however, has demonstrated the fact that it is better to set the trees 50 feet apart each way and reduce the number of rows of corn planted between them each year until it is finally omitted altogether, giving the trees full possession of the soil. This mode of culture usually includes irrigation as long as corn is planted. I think that if the corn and irrigation were left out after the first five years, and the land given clean and thorough cultivation, it would be more profitable for the owners. Shallow cultivation is advocated by the most successful walnut-growers in the valley after the trees have arrived at a bearing age. The old orchards are nearly all planted too close together, and it is reasonable to expect that they will fail to produce good crops sooner than they would if they had been given more room. An examination of any old orchard will show that the outside rows are larger and bear better crops of nuts than the inside ones. Trees twenty years old often have a spread of branches 50 feet across, and I think it safe to say that the roots extend twice as far as the limbs. I have broken roots as large as a pipestem in plowing 25 feet from a tree that has been set seven years. In setting out young trees they should be inclined toward the coast or prevailing winds, and with a little care they can be kept in that position. By using these precautions and insisting on having the tap-root left at least 3 feet long when the trees are dug in the nursery, you will be likely to have your orchard in good shape when it is grown. No limbs should be allowed to grow within at least 6 feet of the ground, as they would interfere with the cultivation of the orchard."

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[*] Hon. Russell Heath, of Carpinteria.
[†] George B. West, of Stockton.
[‡] George W. Ford, of Santa Ana.
[§] A. Dorman, of Rivera.

*"The orchard should be thoroughly plowed with a turning plow, early in the spring as soon as the ground is sufficiently dry to work pleasantly. Care should be taken not to plow so deep as to cut the roots, and as the trees are approached the furrows should be shallowed. In some cases fall plowing is practiced, turning the soil from the middle toward the rows and leaving a dead furrow in the middle. In the spring the operation is renewed and the ground left smooth for the summer. This is a good practice on dry land, as it enables the soil to retain a larger part of the winter rainfall. After the spring plowing the land should be thoroughly harrowed and left. Where irrigation is practiced the orchard should be cultivated after each application of water, usually from five to seven times in the season. Where irrigation is not followed the cultivator and weed-cutter should be used as often as necessary, in order to keep down the weeds that would rob the trees of their necessary moisture and plant elements. The great object of cultivation is to keep the surface soil in a loose condition and prevent the evaporation of the moisture required by the trees for their growth. Of course, where inter-tree crops are grown in the orchard, these rules will have to be modified to suit the crops."

†"That the walnut will grow more luxuriantly and bear larger crops at comparatively earlier age in deep and rich bottom land, well drained, well protected, and with plenty of moisture, is an obvious fact; though there arises another question: whether it is advisable to plant walnuts—a class of trees requiring so much space and with so little regard to the nature of the soil—in our richest land so well adapted to the growing of other valuable crops that have *absolutely* to be raised in *rich land?* My experience in walnut culture, and for twenty years I have imported, propagated, and fruited the leading varieties of Europe, besides having collected a large amount of data on that subject from nut-growing countries, warrants me to say that walnut culture can be successfully carried on on the whole Pacific Coast, provided we plant none but *hardy* kinds; in fact, the success of walnut culture in California lies exclusively in the hardiness of the kinds to be planted."

WALNUTS IN OAK LAND.

There has been considerable doubt entertained by growers as to the outcome of walnut orchards planted on oak land. It has been contended that walnut orchards so planted will never be a success; that the roots of the oak remaining in the soil generate poisonous gases, which eventually kill the roots of the walnut with which they come in contact. Various orchards in the vicinity of Santa Barbara are cited as examples.

‡"The walnut requires well-drained, deep, sandy bottom land, well protected, and where *no* 'live oak' trees have grown within the last century. Everywhere where the live oak has been recently rooted out, the walnut tree will die about the time it bears the second crop, perhaps earlier. The second planted to replace will die in about the fifth year; the third, in the first, second, or third year. I doubt if any walnut trees will do well where an oak forest has recently existed. The elder Pliny, in his work on Natural History, written nearly two thousand years ago, speaks of this fact existing on the northern coast of the Mediterranean, and cautions planters from attempting fruit-growing where an oak forest has recently existed. There are other causes, no doubt, that will prevent success. Trees will die apparently without cause, and the planter, after waiting ten or a dozen years, will be compelled to root them out and try something else. One half of the orchards that have been planted will never be a success."

§"I have noticed in the vicinity of Santa Barbara quite a number of 'English' walnuts and other fruit trees being planted on land recently covered by live oak. These orchards can only result in failures, which the owners can ill afford. The precautions laid down in my essay before the Sacramento Convention in 1886 should not be disregarded until it is practically demonstrated that they are without foundation."

¶"With regard to planting the 'English' walnut on oak land, it is a question that I approach with a great deal of delicacy, especially as I am led to differ from our President (Mr. Cooper), a gentleman whom I esteem as high as any man in the State, as to the poisoning of walnuts. My place of two hundred acres was one mass of oaks, and there is not one single acre of the one hundred and eighty acres now in walnuts but what had oaks that would cut from four to fifteen cords of stovewood, and yet I never lost a tree planted among the oaks. Now, whether the oak is poisonous in the soil occupied by Mr. Cooper's orchard and not in Carpinteria, is a question that only the analyzation of the soil can prove; but in my locality the oak is not poisonous to the young walnut. The great mistake, in my opinion, in the raising of the walnut, is that a suitable locality is not obtained.

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* Wm. Moss, of Rivera.

† Mr. Felix Gillet, of Nevada City.

‡ Hon. Ellwood Cooper, essay before State Fruit-Growers' Convention, Sacramento, 1886.

§ Hon. Ellwood Cooper, address before State Fruit-Growers' Convention, Santa Barbara, 1888.

¶ Hon. Russell Heath, address before State Fruit-Growers' Convention, Santa Barbara, 1888.

"Since the above was submitted, I have made thorough examinations of the effects, if any, of the oak on the walnut, and remain of the opinion that the oak does not contain any substance poisonous or detrimental to the walnut. If dead timber is allowed to remain on land, in the decayed trunks may often be found a large worm that feeds on the decayed wood. In my examinations I have never found an instance where these grubs interfere with the living wood of the walnut or any other tree. That many walnuts planted within the last five years have failed to become profitable, and in many instances have died, I think is very easily to be explained.

"The most suitable land for the walnut is the sandy loam; a light, deep, rich soil, with water not nearer the surface than 12 or 15 feet. Many of the planters have disregarded this requirement, and from this cause can be attributed a great proportion of the loss of trees.

"In the Carpinteria Valley the water has been gradually rising. In my orchard in front of my house, where the water was about 18 feet deep when I planted that part of my orchard, it is now less than 6 feet, and I have lost about twenty acres of twenty-five-year-old trees, by the rotting of the roots. I caution all planters to be careful about the depth of water from the surface. In one part of my orchard I had about twenty acres of soft-shell walnuts all in bearing; these trees have died to such an extent that I do not now replace with that variety. I can find no cause for the dying of these trees, and have concluded, with many others in the same fix, that the soft-shell walnut is a short-lived tree."

The writer, in 1886, visited Mr. Cooper's extensive orchards at Ellwood, near Santa Barbara, and he very kindly showed me the walnut orchards where trees had died, and which land was formerly occupied by live oaks. The then existing conditions fully corroborated Mr. Cooper's views, and my observations pointed strongly to two causes: first, oak roots remaining in the soil, which generated poisonous gases that have a deadly effect on other roots; secondly, shallow soil and imperfect drainage, through which causes scores of trees have died all over the State. That poisonous gases are generated by roots of forest trees remaining in the soil, has been fully proven in other parts of the State. As an example, I will cite the orchard of Dr. Edwin Kimball, at Haywards. The land formerly contained many huge sycamore trees; these were dug up and the land planted to prunes, peaches, and apricots. When the apricots attained the bearing age and were in full fruit, they suddenly died down. The exact spot where a sycamore stood is shown by a vacant circle, upon which no tree of original planting stands. Nearly ten years after large roots were unearthed, which still showed life, and upon being exposed emitted a strong, disagreeable, and unbearable odor. There are many other similar cases on record. This same sad experience was met with by other growers, who neglected to extract from the soil the greater portion of the roots, not only of oaks, but also of pines, sycamores, etc. Even willows have been the cause of much trouble. On the other hand, the greater portion of the largest orchards in the State are located where large oaks, pines, and sycamore trees once stood, but care and precision were exercised in removing the roots from the land. There are many who contend that no trees have died in their orchards from this cause, and they ascribe the death of such trees to the time of year the forest trees have been dug up. It is said that if the trees are dug up during the growing period, the roots remaining in the soil will decay in one or two seasons, acting, in this respect, similar to the tree itself when cut back while growing, being full of sap the sudden check causes death; whereas, if dug up in the dormant state, in winter, the roots act as a cutting, keep alive for many years, and are only prevented from putting forth growth by being under ground. While the theories advanced are logical, and be the causes what they may, success can only result where precision is applied. In places where roots remaining in the ground have caused trouble, the growers have found that it is best to let the oaks stand, and plant trees, around them. They are headed back to prevent too much shade, but as they continue growing the roots do not interfere with the growth of the orchard trees.

SOIL EXHAUSTION THROUGH THE CULTURE OF THE WALNUT, AND FERTILIZERS TO USE, ETC.

By Prof. S. M. Woodbridge, Ph.D., Agricultural Chemist, Los Angeles. Prepared by special request.

The walnut crop is involved in more or less mystery, and is little understood in the abstract, or from a chemical standpoint, although from a practical standpoint the matter of maintaining the original integrity of the soil, and in fact the building up of a poor soil, is well understood and readily accomplished.

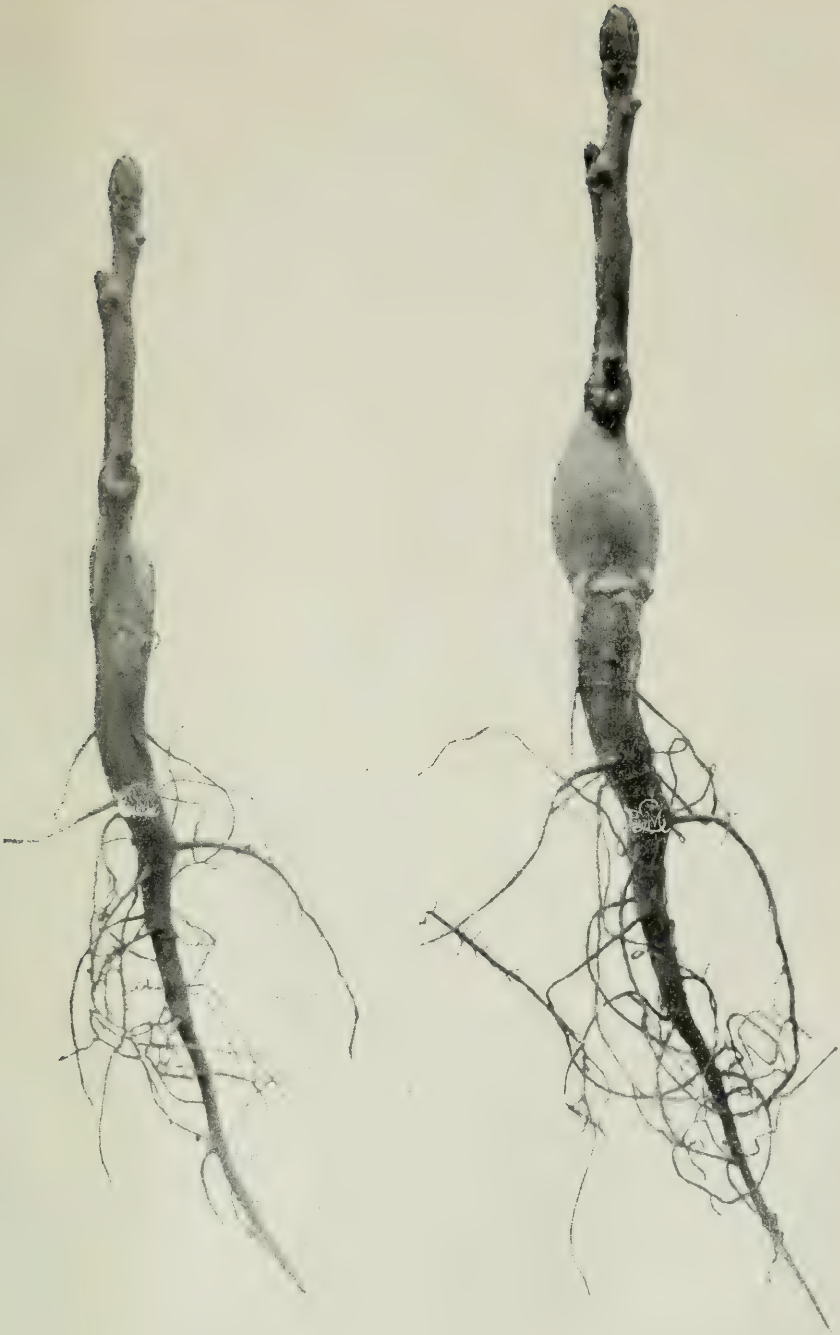
To give an illustration, let us look at the orange. In an orchard in the San Gabriel Valley the soil analyzed 1.14% in potash. Taking the soil to a depth of only 2 feet, an acre of ground would contain about 100,000 pounds of potash; this potash would be enough to supply an annual crop of 20,000 pounds of oranges for more than 2,000 years; the figures from which the above conclusion is drawn are taken from the report of the State Analyst. Before the orchard was fifteen years old, it showed marked signs of degeneration. The practical application of potash in conjunction with nitrates and phosphates, some five years ago, revived the orchard, and the annual application of a complete fertilizer has since kept it in a most flourishing condition.

Again, it is a well-known fact that in new ground, suited to the purpose, from 400 to 500 bushels of potatoes can be raised the first year; the second year scarcely one half that amount can be raised, and the third year the field would hardly give its seed back; and yet the soil of such a field would analyze practically the same at the end of the period as it did at the beginning. Nevertheless, the soil is exhausted from the practical standpoint of the farmer, that is, he cannot raise a paying crop of potatoes; and yet from the standpoint of the chemist the soil is as rich in plant-foods as ever—the little that would have been withdrawn by three such crops, as are above described, being only the ten thousandth part of the plant-food in the soil.

What is true in regard to the exhaustion of the soil by an orange or potato crop is also found to be true in practice in regard to the walnut.

Chemical science has settled the fact that *nitrogen*, *phosphoric acid*, and *potash* are the only three expensive elements that any soil is likely to become deficient in; therefore, as a general rule, those are the only elements that must be added in order to do everything that is known to science in order to properly feed any crop. In order, however, to make these elements, when applied, most effective, the soil must contain a sufficient amount of humus (decomposing vegetable or animal matter).

It is a well-known fact that the best results are attained in horticulture where circumstances admit of a rotation of crops, the same crop not being reached oftener than once in four or five years. In an orchard



1. 2.

ROOT-GRAFTING THE WALNUT.

1. Root, with cion inserted, ready for waxing.
2. Root grafted, tied, and waxed over, ready for planting.

it is impossible to rotate a crop, as the trees are set for a lifetime; but the next best thing to a rotation is in keeping up a rotation of green crops for plowing-under, and in this way keep supplying the humus and nitrogen at a nominal cost. These crops, of course, are planted during the fall, and are grown at a time when the tree is dormant.

In order, then, to get the best results from a walnut orchard two things are necessary: (1) Prevent the soil from becoming exhausted; and (2), keep a due amount of humus in the soil.

The first proposition can be done by applying annually these elements in the proportion in which the crop, the wood, and leaf growth may remove them. It would be both amusing and interesting for a rich chemist with little to do and who might own a walnut orchard to ascertain these facts by a collection of all the leaves, new growth, and crop over a series of years, and his report might be most interesting to the few chemists who would read the same, but the farmer could scarcely keep awake over it. What the farmer desires to know is which and how much of the essential elements need to be added, and the cost of such application. To this question the answer can be given by the crop and trees themselves, although the experiments have not been carried over a series of years; but for two succeeding years excellent results have been attained by using to every 4 pounds of nitrogen, 9 pounds of phosphoric acid and 5 pounds of potash in the form of muriate. The phosphoric acid should be in the form of a super-phosphate, that is, treated with *sulfuric* (sulphuric acid), which renders the phosphate readily soluble in water so that it may be immediately available.

A ton of fertilizer containing the fertilizing elements in the above proportions of 4% nitrogen, 9% phosphoric acid, and 5% potash, should not be worth to exceed $35, freight paid.

Now, as to the amounts to be applied: 5 pounds to a tree three years old appears to be the limit from which any good can be derived; 12 pounds per tree to an eight-year-old orchard produces good results, some of the trees yielding 100 pounds and all the trees averaging over 75 pounds of nuts; on eighteen-year-old trees 25 pounds (per tree) was applied with satisfactory results. Taking the case of the eight-year-old trees, the cost of fertilizing an orchard, where the trees were twenty-eight to the acre, would be $5 60, or about 3½% of the value of the crop.

(8) PROPAGATION.

The raising of walnut seedlings is very simple, but great care and attention are required in all points bearing on the germination of the nuts. There are various methods used, but the most simple is as follows: The walnuts are placed in sand, preparatory to planting. A frame, consisting of 12-inch boards set on edge, of any size desired, and resting on the ground, is half-filled with sand; the nuts are then spread thickly (4 to 6 inches) and covered with about 3 or 4 inches of sand. The sand is kept moist, but not too wet, and in case of lack of rain, is watered. An embankment of earth is made all around the frame to prevent the nuts from drying. They are examined from time to time, and as soon as the nuts indicate or show signs of sprouting they are taken up and planted in nursery rows, from 12 to 24 inches apart.

After the first and second years' growth the plants are of a suitable size to bud or graft, or are left in the nursery as seedlings until large enough to transplant into orchard form, the second or third year.

(9) BUDDING THE WALNUT.

There are several methods employed in budding the walnut, among which the following, by the writer (published in 1889*), has proved very successful: Trees are budded in July, August, and as late as September. The bud is cut (shown in Fig. 8) about 1½ inches long. In cutting the bud from the stick the cut is made deep into the wood, the object being to give the bud as much bark as possible. The wood in the bud is then partly removed; it is gouged out with the sharp point of the budding-knife. This is done to allow the inner bark of the bud to unite with the inner bark of the stock, which union would be prevented if the wood in the bud should be allowed to remain. After the wood has been partly removed (as shown in Fig. 9), the bud is inserted into the slit made in the stock, the same as is done in the ordinary method of budding practiced on fruit trees. The bud is then tied tight, with heavy budding twine of at least 18-ply. Three weeks or so afterward, if the bud has "taken," the twine is untied and tied over again; this is done in order to prevent the twine from cutting into the bark. This, however, is not required to be done if the trees are relaxing in growth, or are of such age as to have a bark thick enough to stand the pressure without injury. On young and thrifty growing trees it is best to loosen the twine at the third week, and it should be removed altogether at the fifth or sixth week. The buds are then allowed to lie dormant until spring, when the stocks are cut back to force the bud to start in the month of March or April, according to locality. As the

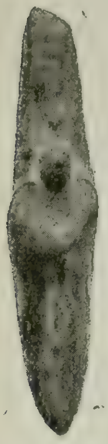


Fig. 8. The bud, front view.

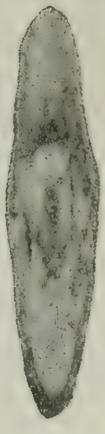


Fig. 9. The bud, transverse section.

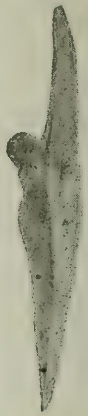


Fig. 10. The bud, side view.

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* Annual Report of State Board of Horticulture, 1889, p. 137.

walnut does not put forth until late in the spring, walnut stocks should not be cut back until they show indications of a rise of sap; with me this has been the most successful time. As soon as the stocks begin to put forth they are cut back and the buds allowed to grow. In cutting back the stocks great care must be exercised. They must not be cut back too close to the bud so as to endanger it, as the stocks invariably have a tendency to die back at the tip, at least an inch or more. As the buds start they are allowed to grow at will until they become hardy; they can then be trained to the remaining portion of the stock or to a stake, in order to produce a straight tree. After the first year's growth they can be transplanted to orchard form.

ANNULAR OR RING BUDDING.

This method is one of the simplest and safest to use on the walnut, and especially adapted to young trees of two or three years old, and to smooth limbs of large trees. In this method a ring is cut right around the stock, about an inch long. Then a ring of about the same size is taken from the cion, containing a bud, which is slipped into the corresponding space in the stock, and then bound tightly with soft cotton twine or cloth, covering it up to exclude the air. The operation should be performed when the trees are in full growth, during July, August, or September, and left to lie dormant through the winter, to be started in the spring.

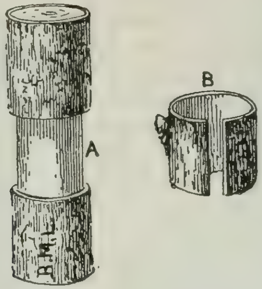

Fig. 11.

A. The stock prepared. *B.* The bud.

(10) GRAFTING THE WALNUT.

Walnut-grafting is not as easily performed as budding. Great care must be exercised in the time and manner in which the operation is performed. The walnut, as a rule, cannot be grafted successfully by the ordinary methods practiced on fruit trees. The reason is that the cions contain but little wood, the pith in them being much greater than in cions of other trees; and when the cion is prepared (wedge-shaped) very little wood is left in it and the bark is so thin that, when inserted, it cannot unite with the stock, not being held firmly in position. Terminal shoots, however, have a thicker bark and more wood and are most successful in grafting. Side grafting is accomplished with success, but can only be performed in the spring, when the sap in the stock begins to rise; this is necessary, as the cion must be inserted when the bark peels, in the same manner as a bud. The walnut does not put forth until quite late in spring, and to secure good, firm wood it becomes necessary to gather the cions before the trees start; and that they may be kept dormant are covered with moist sand and placed in a cellar or cool place. In this way they can be kept until the stocks have made sufficient growth so as to facilitate grafting. I have experimented in grafting the walnut for over twenty years, and the most successful method with me has been the *prong graft* or *prong bud* (of my own origin). (See Plate XX, Figs. 1 to 5, illustrating prong budding.) In this method the small prongs found at the extremity of the shoots are used. (Fig. 2, Plate XX, illustrates the prong—cion—used, and how cut from the branch, reduced one half.) The prong is cut as a *bud*, as shown in the illustration, and the wood is partially removed with the point of a budding-knife, the same as in the method of budding herein described. The stock is first prepared by cutting off with a sharp saw and smoothing over with the knife; a vertical incision is made on the side, and the cion inserted and tied tight with strong budding twine of at least 18-ply. The cuts are waxed over with grafting wax. After the cion has started the graft is examined from time to time, and if it is found that the twine begins to cut into the stock, it is untied and tied again; this will prevent any injury to the stock or cion. The twine, however, should be allowed to remain as long as possible, as it prevents the bark surrounding the slit made on the stock from opening and unseating the cion, which is apt to occur from the action of the atmosphere causing the cion to dry out and die. When the cions have grown from 6 to 12 inches and assumed the functions of the top, this precaution is no longer necessary, and the twine is then removed altogether. The growth of the cions at this time, however, is very tender, and they may be broken off by the slightest touch; as a protection it is well to drive a stake at their side, to which they are tied with some loose material or cloth strips. When this method is employed on large limbs, or on the tops of trees, it is well to tie a piece of limb or wood of any kind on the side of the branch and to which the growth of the cion should be tied. Another good protection is to take a piece of green shoot and tie both ends to the branch so grafted, forming a loop over the bud, to prevent birds, etc., from sitting on the graft and thereby disturbing it.

CLEFT ROOT GRAFTING.

One of the most satisfactory methods practiced on small walnut stocks is the cleft root graft, and its application does not differ materially from the method practiced on pear and apple roots.

The small plants (only one-year-olds are used) are taken up and grafted indoors. (See Plate XVIII, Figs. 1 and 2.) They are cut off at the crown and split obliquely and the cion (wedge-shape) inserted and immediately tied with 6-ply or 8-ply budding twine or cloth, and waxed.* They are then heeled in sand in some convenient place, exempt from

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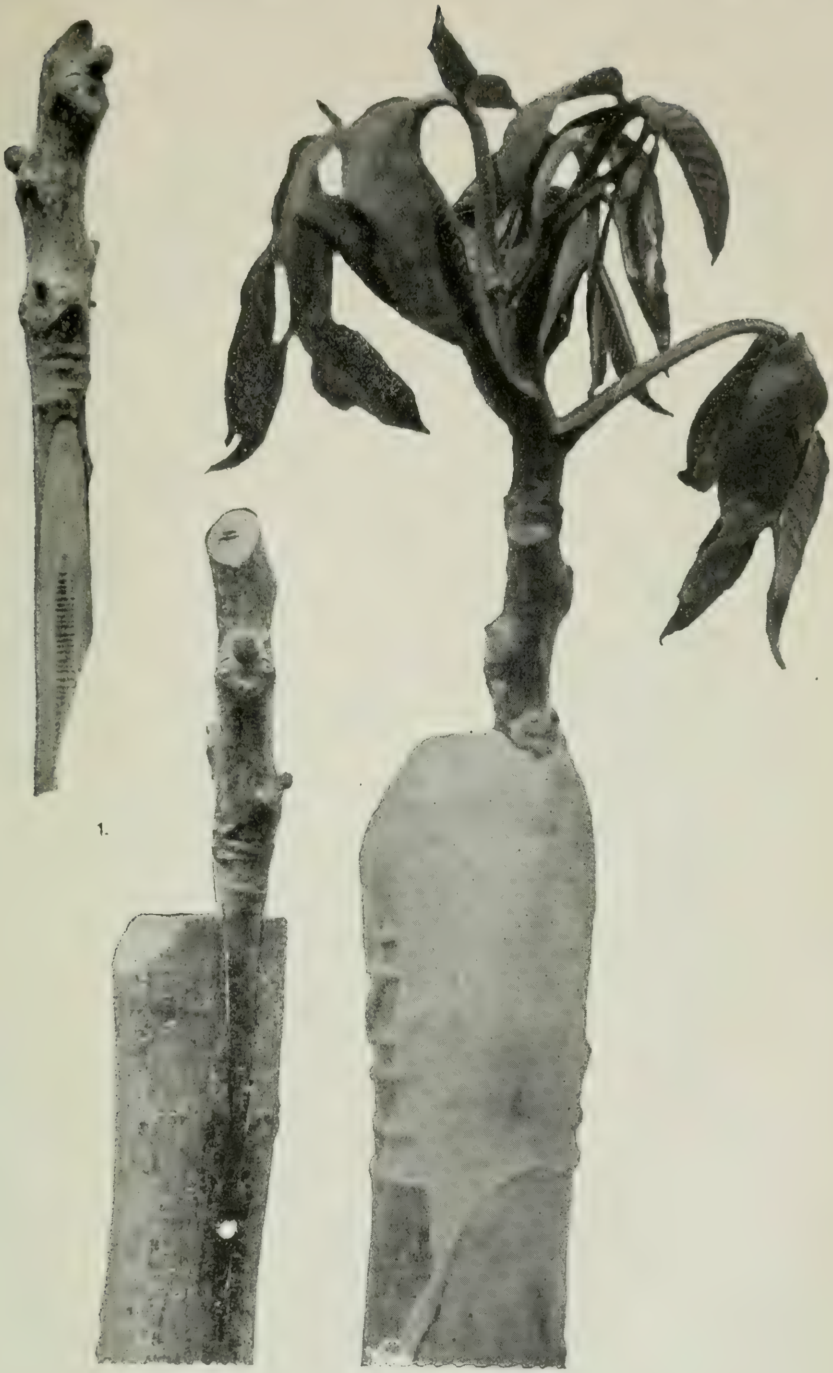
* Only wax the parts cut or exposed, so that on planting the string or cloth on the parts not waxed may decay and not bind the stock. It is also advisable to cut the twine or cloth on planting.



GRAFTING THE WALNUT.

1. The cion prepared.
2. The cion inserted in the stock, ready for waxing.
3. A cion tied and waxed over; growing; three weeks after being grafted in the spring.—From photographs; natural size.

draughts and sunlight, as follows: On the floor of a propagating house or shed moist sand is spread out from 6 to 12 inches deep; then the grafts are put into it standing, thickly, and covered with sand. The entire graft to within an inch or two of the top is covered without injury to it. The sand should always be kept moist, but not too wet, as the bark of the graft is liable to decay; and again, the sand must not be allowed to get dry, as the bark of the graft will shrivel and avoid adhesion. They are kept thus stored from four to six weeks, during which time the parts (cion and stock) callous over; they are then planted in nursery rows, and soon after begin to grow.

TRIANGULAR CROWN GRAFT.

Like the preceding method (cleft root graft) this, too, has proved successful. The stocks (a year old) are not split, but instead a triangular incision is made in the side of the stock, as shown in Fig. 12 at C, about 1 to 1½ inches long. At this point the wood of the stock is generally quite solid and the pith very small. This cut rather consists of taking out of the stock a triangular piece, into which space a cion is inserted of the same shape and size. D shows the space; A the cion prepared for insertion. The cion (from terminal shoots preferred) is prepared to fit the corresponding space, as shown at B, and fitted into the cleft. It is then tied with cloth or twine and waxed over.

This method is also employed with success in the field. The earth is removed from around the stocks and the tree is cut smoothly about the crown or where the swelling of the root begins. The graft being inserted, it is tied with cloth, and waxed. The soil is then banked up against it, covering the graft and stock to within an inch or two of the top of the cion. For making the cleft and facing the cion it is important that the knife be sharp to make a smooth cut. This operation (in the field) is best performed, and most successful, when the stocks begin to show signs of growth late in the spring. The cions are cut late in the fall, or early spring, and kept in sand preparatory to using.

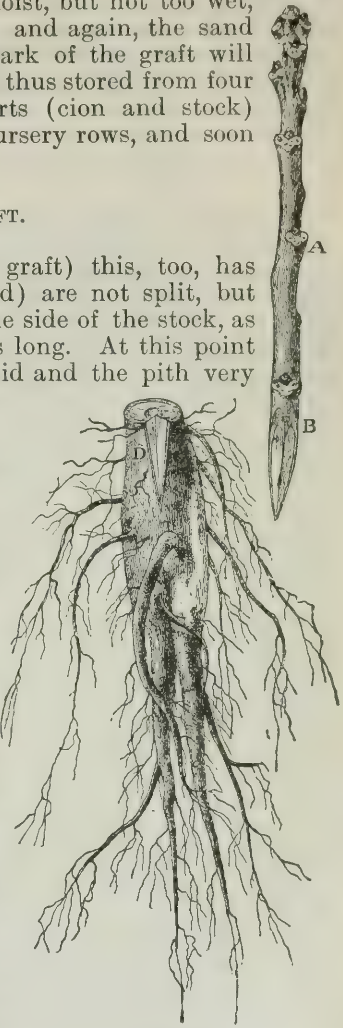


Fig. 12.

CLEFT SAP GRAFT.

Much credit is due to Mr. Felix Gillet, of Nevada City, who has experimented with all sorts of grafting on the walnut for many years, for having given the public the results attained by him in the use of this method. The operation is performed early in the spring when the sap is commencing to flow, and can be used on large limbs from 3 to 5 inches in diameter. The limb is sawed off and smoothed as for ordinary cleft grafting; instead, however, of making a single cleft through the center, two are made, one across the stub at each side of the center, the clefts then being in sapwood instead of through the heartwood and pith. The cion is prepared as for ordinary cleft grafting, for which purpose it is best to use terminal shoots. In cutting the cion great care must be exercised to cut only into the pith of one side. The cion having been inserted, the wound is bound well with cotton cloth and thoroughly waxed.

(11) THE BLACK WALNUT (*Juglans Nigra*, Linn.).

The relative merits of the black walnut for stocks to graft onto have been under consideration for many years, and this root has been extensively tried in this State, with satisfactory results. The variety mostly used is the *Juglans Californica*, or California black walnut. (Plate XXI, Fig. 11.) In a few instances *Juglans Americana*, or Eastern black walnut (Plate XXI, Fig. 9), has been tried, but preference was given to the former, being indigenous to our State. The Japanese walnut (*Juglans Sieboldiana*) has also been tried, and has proved quite satisfactory, but is not as strong a grower as the *Californica*. For a time I was loath to believe the stock would influence the graft and cause it to produce nuts of a dark shell. Experiments, however, have proved the contrary. Trees now in bearing for over twenty years show no variation in color of shell, but an improvement in kernel and quality of the nuts. The stocks are thrifty and healthy, easy of propagation, and easily budded and grafted. Some twenty years ago I commenced experimenting in grafting and budding the wild walnut, with very satisfactory results. A plot of *Juglans rupestris*, growing along the mountains in Los Angeles County, was worked over to different varieties very satisfactorily, but the stock is quite scrubby and of such dwarf habit that it can only be recommended for dwarf purposes. The grafts took well and made splendid growth. In all tests made on trees in the wild state, nuts were produced on buds and grafts the second and third years. In some cases the nuts were quite small, due perhaps to the stunted condition of the stocks, for all must have been very old. The buds and grafts that made the strongest growth were on stocks which did not look so aged. These are now producing fine nuts, equal to those from the parent tree.

The oldest walnut orchard budded on the *Californica* is at Winters, Yolo County, and the trees are over twenty years old. This orchard has produced fine crops yearly and the nuts show a marked improvement over those produced by the parent trees.

At Vacaville two rows of large black walnut trees (*J. Californica*) were worked over to different varieties of the "English" or "Persian" walnut very successfully, by the prong bud method, described elsewhere, and the ordinary cleft sap graft. The trees were planted some thirty years ago for shade along the roadside. In the winter of 1892 the limbs were cut back to the crotch or main stem. In the spring they put forth numerous shoots, which were thinned out to a dozen or so to each tree, according to the spread of the branches. These new shoots were budded in the summer. Those that did not "take" were grafted in the winter. Thus a fine stand of buds and grafts was obtained, which commenced to bear the second and third years. They now form large spreading heads, and bear regularly.

The process of converting these apparently worthless trees, except for shade, into fruitful trees, was very simple, and has proved remunerative and entirely satisfactory to its projector.

In Ventura County are to be seen many walnut orchards of recent planting budded and grafted on this stock. This was brought about by the satisfactory results obtained from walnut orchards so worked of early planting. In the past few years large plantings of walnuts have been made, and many growers have given preference to trees grafted and budded on this stock—*J. Californica.*

VARIETIES OF THE BLACK WALNUT.

Since the relative merits of stocks for the walnut have been discussed, it is deemed proper to append a list of varieties with which further trials can be made. The following varieties and their description (marked with *) are taken from a bulletin on "Nut Culture in the United States," issued by the Division of Pomology of the Department of Agriculture:

**Gordon.*—"Size large, form cubical, slightly conical at each end, shell of medium thickness, cracking qualities good, kernel light-colored, plump, quality excellent."—Virginia.

**Missouri.*—"Size medium, form oval, compressed, with quite smooth shell, cracking qualities good, kernel light-colored, plump, flavor pleasant, quite free from the grossness characterizing the species; quality very good."—Missouri.

**Peanut.*—"A rather small pyriform nut. The shell is thin and easily cracked, while the kernel, which is in the larger end of the nut, comes out entire. The kernel is white and of delicate flavor."—Ohio.

**Nurza.*—"A large nut with thin shell, kernel large and of good flavor. Also a strong grower."—Ohio.

**Taylor.*—"A quadrangular-pointed nut of good size. The shell is thin and easily broken with a slight blow. The kernel is large, coming out in halves; the meat is white and of fine quality."—Ohio.

**Thomas.*—"Size large, form oblate, compressed, slightly pointed at base, considerably so at apex, shell medium to thin, cracking qualities medium, the kernel not easily removed in perfect halves from the shell, flavor sweet, rich, quality good to very good."—Pennsylvania.

American ("*Eastern*") (Plate XXI, Fig. 9).—So called by reason of having been produced from seed imported from the East. The tree is large and handsome, and reproduces itself or "comes the same" from seed. The seed germinates easily, and the plants stand transplanting and are easily budded and grafted. It makes a beautiful shade tree along driveways and avenues. The nut is of medium size, very dark, and somewhat furrowed, and hard.

California (*Juglans Californica*, Watson) (Plate XXI, Fig. 11).—A rapid-growing tree, indigenous to the central and northern parts of the State. It occurs nowhere below the Sierra Madre Mountains and Coast Range in the wild state. "Comes the same" from seed, stands transplanting, and is easily budded and grafted. The nut is of medium size, shell quite hard, and smooth. The kernel is quite rich and oily. This stock has come into great favor for budding and grafting onto. The tree attains great height, and many trees are to be seen over 100 feet high, and of great dimensions. This species has been confounded with the Dwarf or Wild Walnut (*J. rupestris*) indigenous to the southern part of the State, extending from the Tehachapi Mountains into Arizona and Mexico.

Dwarf or *Wild Walnut* (*Juglans rupestris*, Eng.).—This species is indigenous to the southern part of the State, extending from the Tehachapi Mountains to the south. It is a small, dwarfish tree, but a vigorous grower. "Comes the same" from seed, and is easily budded and grafted, also bears transplanting. The nut is quite small, very hard and smooth, but of little or no commercial value.

(12) PRUNING THE WALNUT.

* "During the first year constant pruning is necessary to have the tree properly shaped. I have pruned in a summer as many as four or five times. Branches are apt to grow too rapidly, bear down with their own weight, and break off during high winds, destroying the symmetry of the tree and occasioning much loss of time. All lateral branches growing from the leader should be cultivated to assume an upward angle of about 15° to 45° from the main leader. This can be done by clipping off all branches growing under, and at times cutting off the ends. A trunk should be maintained free from limbs 3½ to 4½ feet from the ground. Earth should be kept away from the trunks, and if the top roots near the trunk are exposed, so much the better; it will assist the tree in breathing. The most careful cultivation is necessary, and nothing, after the fifth year, should be grown between the rows, unless you have plenty of water to irrigate by flooding all the ground once every eight weeks; if you are so prepared, sow your orchard in alfalfa, and do no cultivating."

† "Pruning the walnut is extremely simple and can be done by any one. When planting the tree, don't cut the top off of one-year-old trees, but it is absolutely necessary to cut back a two or a three-year-old tree; in fact, the finest young walnut orchard I know of in Orange County (and we have lots of fine ones down this way) was grown from two-year-old trees from 8 to 10 feet high, and cut back to about 4½ feet, and all limbs below that trimmed off, except three or four, which were allowed to grow up and make the top of the tree. Never prune the trees over 3½ feet, as the bark of a tree is easily sunburned, and thus it is necessary for the foliage to shade the trunk. If the lower limbs extend outward and are in the way of the cultivator, tie them up, for by so doing you can train the lower branches upward, so as to cultivate close to the tree, and when the orchard comes into bearing the limbs growing upward will not bend down to the ground with the fruit, so you cannot get within twenty feet of them with the cultivator."

‡ "In pruning it has been the custom to trim to a height of 6 to 7 feet, but I think 4 to 5 feet better. Such high pruning makes the tree top-heavy, and the prevailing winds cause them to lean, exposing one side of the trunk to the sun, thus causing sunburn. I think it best to trim little, if any. It is the nature of the tree to allow the limbs to grow downward and fill any space of account that may have been made by pruning, while if allowed to grow in their natural state, the limbs will start near the ground, growing upward and keeping out of the way much better than when allowed to hang down. I have not been able as yet to grow them just as I would like in this respect, on account of raising crops (mostly corn) between the trees, and I find it very difficult to save the lower limbs while young and tender, as a very little push or strain when plowing will injure them next to the trunk, and they should then be cut off to save the tree from greater injury than the loss of a limb. Avoid crotches or forks. If a tree is about evenly divided the abundance of foliage the tree has in summer will cause it to split with a very little wind, and you will thus lose the use of the tree for several years, if not altogether. If badly broken, start a new shoot near the ground, and in six years, with care, it will be a bearing tree."

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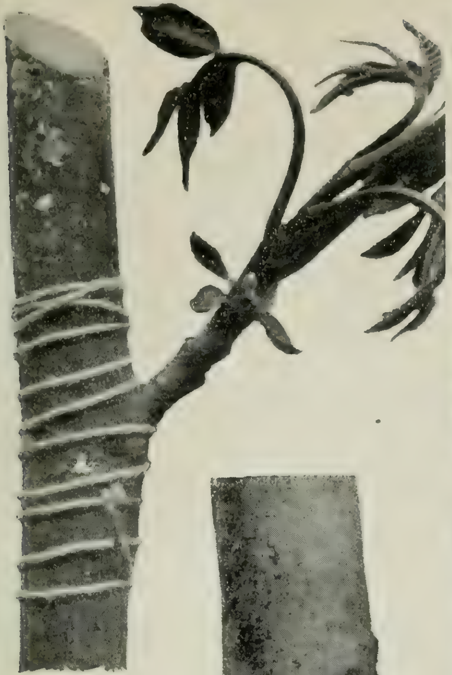
* Hon. Ellwood Cooper, Santa Barbara.

† George W. Ford, Santa Ana.

‡ C. A. Caufman, of Rivera, in "California Cultivator and Poultry Keeper," October, 1896.



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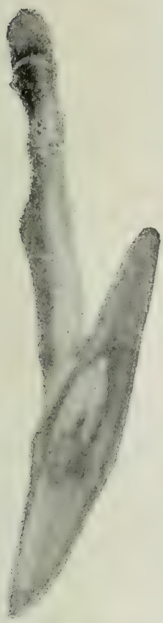

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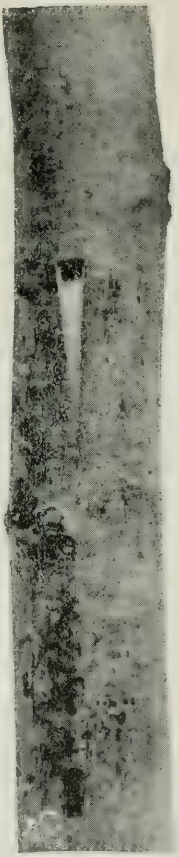

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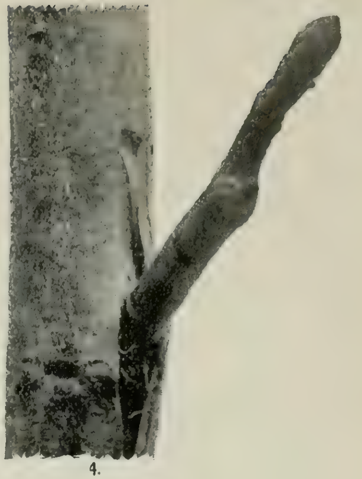

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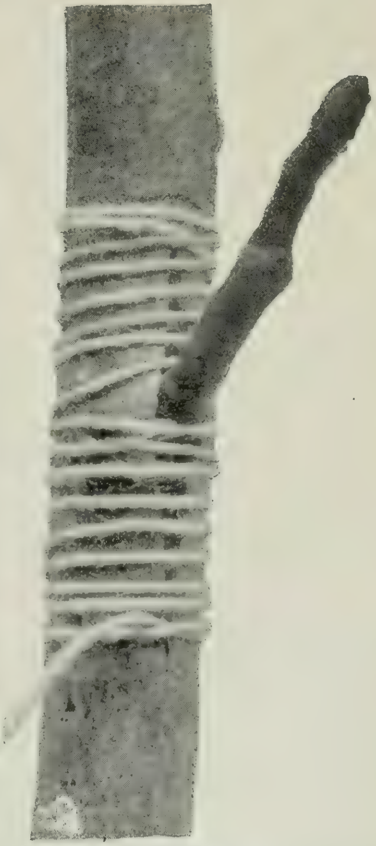

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1. Prong-bud growing, showing the stock where first cut back and waxed over; also the twine tied loosely to prevent the opening of the bark and endangering the bud.
2 The bud prepared, ready for insertion into the slit in the stock.
3. The stock prepared, ready to receive the bud.
4. The bud inserted, before being tied.
5. The operation complete.—From photographs; natural size.

(13) HARVESTING.

Harvesting the walnut is very simple, as most of the nuts do not have to be picked, for they, of their own accord, drop to the ground at maturity; yet considerable attention must be paid to the gathering of the crops so as to have clean, bright nuts that may command a high price and ready sale. The walnut harvest begins in September and ends in November. In some sections the crop comes in quite early and is gathered in September, overlapping into October; in others, the crop is not harvested so early; but October is the principal month, sometimes overlapping into November.

Some of the growers collect the nuts from the ground as they fall every day, others collect them every other day, and some every third day, until most of the crop has fallen of its own accord, and those remaining on the trees are knocked down by means of a pole. Boys and men are also employed to climb the trees and shake the nuts down; others agitate the limbs with a long pole having a hook at the end. The nuts that are ready to drop come down easily, and are picked up and dried on trays in the sun. It generally takes from three to four pickings to gather all the nuts from a tree. When the husk inclosing the nut shows no signs of cracking it is an indication that the nut is yet unripe, and when knocked down the kernels of many of these generally dry away and do not fill well. Then, again, if the nuts are allowed to hang on the trees or remain on the ground too long after falling, they absorb moisture and rapidly deteriorate in flavor, color, and keeping qualities. In the walnut sections along the coast damp fogs and dew prevail during the harvest time, rendering the husks quite moist, and the nuts contained inside become stained by the acid juice of the husks, which, if not removed, renders the nuts quite black, and lessens their market value. This acid is very strong and adhesive, and to remove it the nuts have to be washed and afterward dried. Hon. Ellwood Cooper, of Santa Barbara, has a most perfect apparatus for washing and drying the walnut, which is an invention of his own. It consists of an iron cylinder with a long opening on the top side, where the nuts are put in. When the nuts are washed the cylinder will turn with the opening down, thus letting the walnuts and water out. As with all other apparatus of this kind, it has to be seen to be appreciated. They are made by the Fulton Iron Works, of San Francisco, and cost from $125 to $140.

* "The 'hard' shells should and the 'soft' and 'paper' shells *must* be gathered as soon as possible after dropping from the trees, as it injures the quality and appearance of the nuts to remain long on the ground. They are usually dried on trays about 3 feet wide by 6 feet long, holding about one hundred pounds each. 'Soft' and 'paper' shells should be dried in the shade, and many of the growers have buildings for that purpose. After they are thoroughly dried they are bleached and then run over a screen with a one-inch mesh, into strong sacks of uniform size, each sack bearing the registered trademark of the 'Los Nietos and Ranchito Walnut Growers' Association,' and also the name of the individual grower, thereby settling the question of responsibility in case the nuts are not up to the required standard."

† "There are different modes of gathering: some clean the trees at once, and others go over them several times. I pick what has fallen without knocking. I then tap those limbs lightly on which the nuts are ripest, and the third time over I aim to clean the trees. The walnuts are picked up and put in sacks and barrels, so as to be easily

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* A. Downer, of Rivera.

† Joseph Sexton, essay before Ninth State Fruit-Growers' Convention, 1888.

handled, and hauled to a sunny place to dry, and should be placed on elevated platforms made of narrow boards, with spaces of one fourth of an inch between each board. The platform should be about 8 feet wide and 40 feet long, or as long as two men can handle a canvas to cover the beds, which should be done every night the dew falls. The nuts should be stirred in these beds once or twice each day, and with favorable weather they will dry sufficiently in three days, and are ready for market. I have always dried my walnuts by the sun and they have given good satisfaction, and for small orchards I think it is the cheapest and best way. Some dry by evaporation and claim it is preferable to the sun; that it sets the oil quickly and prevents the nut from becoming rancid. Others claim that it makes them so; but be this as it may, those having large orchards cannot depend on drying all by natural heat, and the drier will have to be used, even if it is not so good for the nut."

*"In handling the nuts, I cure in dry-houses by artificial heat, heating sufficient to evaporate the water and set the oil of the nut. When this is done the nuts will keep sweet for an indefinite time. I have kept them as an experiment, in my store-house, which is of concrete, for five years, and at the end of that time they were as sweet as when first cured. With my facilities, I cure them in eight hours. In preparing them for market, I have a washing apparatus—invented by Mr. Cooper—which I use if the nuts are discolored, as they often are by coming in contact with leaves or shucks when there is dew or rain. Directly after washing they are thoroughly dried and cured in the dry-house."

†"In gathering soft-shells, the nuts should not be left long on the ground, as the sun and fog will cause the shell to crack and the nut to become ruined. They should not be left long in the gathering-sacks, as they will then sweat and turn black. If the nuts are to be washed it should be done as soon as emptied from the picking-sacks, as they will then clean much easier. After this, spread in trays for drying. If to be bleached they should be thoroughly dry before. We use trays 3 by 6 feet, with sides 4 or 6 inches high, and a slat bottom with ½-inch space between slats. For the past few years all walnuts grown in Rivera have been scoured by placing them in a wire cylinder, washing them and revolving it for five or ten minutes, or longer if necessary to make them clean, then throw on water enough to wash clean before taking out of washer. This greatly improves their appearance, removing all fiber and pieces of hull that might be sticking to them. It also gives them a much smoother appearance. Now place them in trays, and dry."

ANNUAL AND BIENNIAL CROPS.

During many years the opinion entertained by many, that the walnut was a biennial bearer—that is, a crop could only be expected every other year—became prevalent, and was generally believed. This idea originated in the minds of some who could not be satisfied unless they saw *all trees* heavily laden with walnuts every year, and also owing to many of the orchards being planted to those singular and unproductive trees referred to elsewhere. On this account—the idea having become general—many hesitated about going into the business. As a rule, fruit-growers are not accustomed to wait for results, as one must do in the case of the walnut. Since the principal walnut plantations have come into bearing, this idea has been dispelled, it having been proved a fallacy. For about twelve years the orchards of twenty years ago have been bearing, and while they prove to be regular bearers, show that one year they bear a heavy crop, and the next one not so heavy, but a *crop* may be depended on every year; so that the walnut, while it may be considered a biennial bearer, must be classed as a tree producing regular crops, or a good bearer.

COMMERCIAL GRADES.

The walnut crop of the State is classified commercially under the following category, viz.:

Hard-shells include all nuts having a hard shell; these take in the numerous varieties of the so-called "English" walnut.

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*Hon. Russell Heath, essay before Eleventh State Fruit-Growers' Convention, 1889.

†C. A. Caufman, of Rivera, in "California Cultivator and Poultry Keeper," October, 1896.

Soft-shells include all nuts having a soft shell, and take in the improved varieties of the so-called "English" walnut, and foreign varieties of this texture.

Paper-shells include varieties of walnuts having an extra thin shell.

The walnut-growers of Southern California have agreed upon a uniform method of grading, which is by passing the nuts over a screen with a one-inch mesh, and making two grades only for the market. The paper-shells are kept separate, and sold as a fancy grade. The marketing methods adopted by the coöperative societies are to receive the nuts from the growers as they come from the orchard, and sulphur, grade, sack, and sell them.

The walnut is marketed in sacks, specially made, and holding about 120 pounds. Some, however, use the common grain sack, holding about 65 pounds. Before sacking, many growers place the walnuts in a wire cylinder of one-inch mesh, the friction of which on revolving gives the nuts a smooth appearance, and thus adds to their commercial value.

(14) ENEMIES OF THE WALNUT.

The walnut, so far, has fewer enemies than most trees, and the few that attack it are not considered detrimental to its culture in a high degree, for they are easily subdued. These are treated of separately in this chapter.

RED SPIDER.

Tetranychus telarius.

This spider, or mite, attacks different species of trees, shrubs, etc., also the walnut. It is very small, and can hardly be seen without the aid of a glass.

This insect, while not very troublesome on the walnut, is kept in check by dusting sulphur over the trees. The lime, sulphur, and salt solution, applied in winter, and the summer remedy, given below, have practically exterminated the pest on walnut trees.

Winter Remedy.—Unslacked lime, 40 pounds; sulphur, 20 pounds; stock salt, 15 pounds; water to make 60 gallons. Place 10 pounds of lime and 20 pounds of sulphur in a boiler, with 20 gallons of water, and boil over a brisk fire, for not less than one hour and a half, or until the sulphur is thoroughly dissolved. When this takes place, the mixture will be of an amber color. Next place in a cask 30 pounds of unslacked lime, pouring over it enough hot water to thoroughly slack it; and, while it is boiling, add the 15 pounds of salt. When this is dissolved, add to the lime and sulphur in the boiler, and cook for half an hour longer, when the necessary amount of water to make the 60 gallons should be added.

Summer Remedy.—Sulphur, 3 pounds; caustic soda (98%), 2 pounds; whale-oil soap, 25 pounds; water to make 100 gallons. Boil the sulphur and caustic soda together in about 2 gallons of water; when the sulphur becomes dissolved, add the soap and boil until thoroughly dissolved, then add water to make 100 gallons of solution, and apply warm.

YELLOW SPIDER OR MITE.

Tetranychus.

Apply same treatment as for red spider.

WALNUT SCALE.

Aspidiotus Juglans regia, Coms.

The walnut is subject to infection from this scale peculiar to itself, and known as the walnut scale. The scale, however, has not proved a pest among our walnut trees. The old trees do not suffer from its attacks, as it infests the large limbs principally.

Remedy (applied when trees are dormant in winter).—Lime, 25 pounds; sulphur, 20 pounds; salt, 15 pounds. Take 10 pounds of lime, 20 pounds of sulphur, and 20 gallons of water; boil until the sulphur is thoroughly dissolved. Take the remaining 15 pounds of lime and 15 pounds of salt, and when thoroughly slacked, mix together and add enough water to make in all 60 gallons of solution; strain and spray warm.

BROAD-NECK BORER.

Prionus lacticollis, Drury.

This gigantic beetle appears during July and August, but at times much earlier, and also late in winter. The beetle measures from 1¼ to 2 inches in length. Color dark brown, nearly black. Possesses strong, thick jaws. In the male the antennæ are rather slender; in the female they are not so stout, and the body is much broader. The larva (Fig. 14) is a large borer with a broad neck. It measures from 2½ to 3 inches in length. The color of the larva is yellowish white. The head is quite small and is reddish brown. There is a light blue line down the back. As a rule it mostly attacks trees and vines just below the surface. It bores a hole through the center of the root, or into the trunk. On the trunk of trees and vines it never bores very deep, seemingly preferring

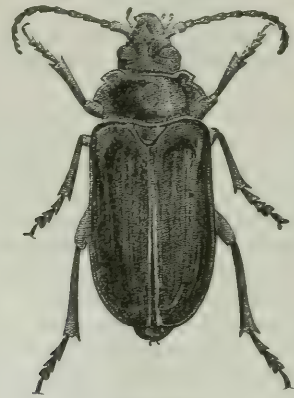

Fig. 13.

to work just under the bark. The larva cannot easily be discovered, for the reason that the trees do not begin to show the effects until the larva has had time to develop to its full size, when it becomes a voracious feeder. The larva remains in that state three days, and changes to the chrysalis state about the month of June, as the beetles generally make their appearance in July.

Remedy.—It is very difficult to ascertain the presence of borers before the trees indicate their presence. Walnut trees sometimes are observed to be bleeding (oozing sap) from a certain spot; this indicates a borer, or having been damaged otherwise. However, the cause should be carefully looked into by cutting into the bark, and the borer destroyed. The wound should then be covered over with such material that will prevent the action of the atmosphere from injuring the tree.

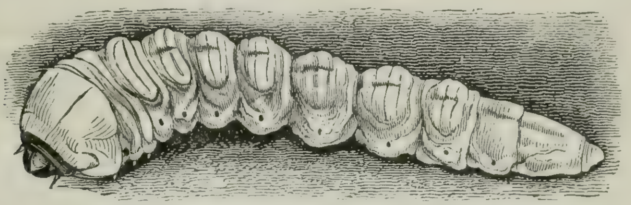

Fig. 14.

SPAN WORM.

In 1891 there appeared in this State, at Santa Barbara, a caterpillar commonly known as the "span worm," infesting the walnut in great numbers, and in some places the trees were almost completely defoliated. The insect is easily subdued by the following remedy: Paris green, 1 pound; water, 200 gallons. The remedy is applied as soon as the caterpillars make their appearance in the spring.

WALNUT APHIS.

This insect attacks the walnut in some sections, and its exudations form on the tree a sort of "honey dew," which forms into a fungus and renders the foliage and husks quite black.

The black Australian ladybugs, *Rhizobius ventralis*, *Rhizobius debelis*, and *Rhizobius Toowoombæ*, have kept this insect in check, through which agencies the injury is not felt.

WALNUT BACTERIOSIS.

The only known disease, aside from "root knot," reported as attacking the walnut, which has caused some alarm, is a species of fungi.

*"It is not known as yet whether the primary cause of the trouble is due to some derangement of the vital functions of the plant or to parasitic organisms. The progress and destructive action of the disease are certainly very apparent. A small black spot first appears on the side of the nut husk while the kernel is still in the milk. The death of tissue beneath this spot gradually extends, spreading inward, and soon reaches the shell. Unless the shell is already hard the decay penetrates through the soft meat of the nut within, and the whole is soon disorganized and turns black. * * * A study

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*Report of Division of Vegetable Pathology, Department of Agriculture, 1893, p. 272.

of the diseased tissue shows the presence of a bacillus, the organism being constantly present. Pure cultures of the bacillus have been obtained from spring inoculations, the tissue of the nut husk being too firm in the latter part of the season to test the action of the organism with any degree of certainty. Observations indicate that unfavorable root conditions for the trees may have an important bearing on the primary development of the trouble."

This disease was reported as being prevalent among walnut trees in the central part of the State in 1891. Since then, however, the trees are said to have recovered, and, on investigation, it was found that it was not this disease, but the trouble was caused by the soil drying out in the summer, causing the trees to lose considerable of their foliage and the nuts to shrivel.

This bacterial or mysterious disease has made its appearance in various walnut orchards in different parts of the State, and threatens to seriously affect the walnut groves unless checked by some effective remedy. The disease has been termed *Bacteriosis* of walnuts, by Prof. Newton B. Pierce, Assistant U. S. Pathologist, and is described* by him as follows:

"Bacteriosis of walnuts is a bacterial disease of the nut, branch, and leaf parts of the Persian walnut (*Juglans regia*). Inoculation experiments have demonstrated that other forms of *Juglans* may also be artificially infected by the organism. Under natural conditions the nut of the Persian tree is very commonly infected in the blossom, at or about the time of pollination. Secondary infections may take place through any portion of the hull of the tender nut, especially during the more rapid growth of spring. The new shoots and leaves may be infected at any portion which is tender and rapidly growing, but most of these infections actually take place at or near the growing point of such shoots, and only become distinct to the naked eye after rapid growth has left the infected part some distance down the branch. Injury to the cells of the nut, branch, or leaf parts is effected by the organism by means of an enzym, or ferment. This enzym acts chemically upon the tissues surrounding the point of infection, destroying the cells and preparing them as pabulum for the multiplying bacilli. This enzym is capable of destroying the tender cells of the hull, newly forming shell, and the contents of the kernel. As any or all of these parts become hard with age, less injury is done through infection by this germ. In case of blossom infection the nut is usually badly diseased, and, in a majority of cases, will fall when one third or two thirds grown. Lateral infection of the hull is less likely to wholly destroy the nut, but very commonly causes it to fall or the hull to adhere to the shell in such a manner as to make the nut unfit for market. Wherever the nut becomes infected the parts eventually turn back, owing to the oxidation of the tannic acid. When the disease is actually spreading, however, a circle next the healthy tissue usually assumes a watery appearance, which may be used as a character quite distinctive of this disease. This watery ring is where the enzym is acting upon the healthy cells often in advance of the presence of the organism itself. The characters here given for infected nuts are equally applicable to infected branches.

"The germs of this disease are capable of wintering either in the diseased branch or nut.

"The treatment of walnut bacteriosis has already shown some beneficial results. Over forty acres of spraying experiments were set on foot last spring. This work was done with the leading fungicides, but as the disease is now known to be of bacterial nature, it will be attempted to prevent the same by means of some of the leading germicides, with which, applied as winter sprays, it is hoped to obtain even better and cheaper results than with the standard fungicides. As this work is still in progress, and certainly cannot be completed inside of another year, it cannot be summarized at this time. It may be said, however, in absence of the perfection of better methods, that the Bordeaux mixture applied to the tree just before the growth of spring starts, and again to the nuts as soon after pollination as possible, will certainly prevent a portion of the infections which would otherwise take place. It has also been found of advantage to gather and destroy diseased nuts, and to prune away diseased branches during the winter. It is hoped that another season given to the testing of germicides may develop some more specific manner of preventing infection. No treatment looking to the cure of diseased nuts or branches may be hoped for; all treatment must be preventive."

In the "California Fruit-Grower" of October 17, 1896, Professor Pierce adds to the above the following note:

"The walnut disease has a wide distribution on this coast, extending as far north as Stockton, and south to San Diego County. There probably are, however, large intervening regions not affected. The disease does no special damage to the year-old wood only spreading a new growth, hence there is no danger whatever of the tree being killed outright—it is largely a matter of loss of crop and injury to spring growth. Its spread will largely depend on the atmospheric conditions each spring. Moisture of the atmosphere is favorable to the disease, and a dry atmosphere is unfavorable to it."

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* In California Fruit-Grower, September 26, 1896.

ROOT KNOT OR GALLS.

(Plate XVII, Fig. ?.)

Among walnut trees these so-called "root knots" or "galls" have of late been quite prevalent. The origin of this curious disease is not fully known, but, in some cases, it is the work of a minute insect—the nematode. So far, the best remedy is to cut away the knots or galls and completely remove the affected wood, and apply a solution of bluestone in the fall, as strong as the water will dissolve. This is applied with a swab, and the earth again thrown back. The safest way to use bluestone is in the form of *Bordeaux* mixture, which can be applied any time of year. Take sulphate of copper, 16 pounds; lime, 30 pounds. Dissolve the sulphate of copper in 22 gallons of water; in another vessel slack the lime in 6 gallons of water. When the latter mixture has cooled, pour it slowly into the copper solution, care being taken to mix the fluids by constant stirring.

(17) AREA OF WALNUT CULTURE IN STATE.

The walnut is now found growing throughout the State in almost every county. In 1892 a tree census was made by the State Board of Horticulture, through agents in the field, and the following acreage was found to be in walnuts:

County.	Bearing, Acres.	Not Bearing, Acres.	Total Acres.
Alameda	28	8	36
Alpine			
Amador	3	6	9
Butte	5	7	12
Calaveras	12	11	23
Colusa	20	40	60
Contra Costa		50	50
Del Norte			
El Dorado	3	5	8
Fresno*	10	60	70
Glenn	30	50	80
Humboldt	3		3
Inyo	1	3	4
Kern	30	41	71
Kings			
Lake	15	60	75
Lassen		2	2
Los Angeles	1,752	37	1,789
Marin		1	1
Mariposa	8	4	12
Mendocino			
Merced	7	7	14
Modoc			
Mono			
Monterey	7	16	23
Napa	12	28	40
Nevada	13	6	19
Orange	1,467	1,125	2,592

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* Before Madera County was formed.

Area of Walnut Culture in the State—Continued.

County.	Bearing, Acres.	Not Bearing, Acres.	Total Acres.
Placer	7	15	22
Plumas			
Sacramento	26	18	44
San Benito	35	9	44
San Bernardino*	131	70	201
San Diego	389	178	567
San Joaquin	27	42	69
San Luis Obispo	245	234	479
San Mateo			
Santa Barbara	1,117	786	1,903
Santa Clara	10	7	17
Santa Cruz	3	10	13
Shasta			
Sierra	2		2
Siskiyou	1	1	2
Solano	12	57	69
Sonoma	38	42	80
Stanislaus		3	3
Sutter	13	2	15
Tehama	4	26	30
Trinity	20		20
Tulare	4	8	12
Tuolumne	7	6	13
Ventura	997	5,308	6,305
Yolo			
Yuba	5	3	8
Totals	6,520	8,392	14,912

No reports were made from Alpine, Del Norte, Modoc, Mono, and Plumas counties, where it is doubtful, on account of climatic conditions, if walnut trees will grow. On the other hand, no reports were received from Mendocino, San Mateo, Shasta, and Yolo counties, where orchards of recent planting are located. Thus it will be seen that the bulk of the walnut orchards are in the lower counties, where the tree finds a congenial home and most favorable conditions essentially required. Ventura County leads, with 6,305 acres; Orange is next, with 2,592 acres; Santa Barbara is third, with 1,903 acres; then comes Los Angeles with 1,789 acres, San Diego with 567 acres, San Luis Obispo with 479 acres, and San Bernardino with 201 acres. The total acreage in the State in that year was given at 14,912 acres, of which 6,520 were in bearing. Readers no doubt understand how difficult it is to obtain accurate statistics, and while we make no pretention of the above figures being strictly correct, yet we believe they are approximately correct and show to what extent this industry is carried on in the various counties. The County Assessors are obliged to gather a complete tree census every year, and while they endeavor to comply with the law as well as they can, they are hindered from furnishing a true account through the laxity of the growers, who reluctantly give the figures of their orchards. The gathering of such statistics yearly, however, serves a good purpose, as the reports show where fruits of the different kinds are produced and the extensions that are made in this line.

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* Before Riverside County was formed.

According to the Assessors' returns there were growing in 1896 the following number of walnut trees in the State, in the various counties:

Alameda	2,200	Marin	75	Sacramento	3,272	Sierra	50
Amador	250	Mariposa	280	San Benito	3,405	Solano	2,979
Butte	1,185	Madera	71	S'n Bernardi'o	11,500	Sonoma	4,286
Calaveras	500	Mendocino	112	San Diego	19,491	Stanislaus	270
Colusa	7,880	Merced	933	San Joaquin	2,475	Sutter	2,734
Contra Costa	4,650	Modoc	56	S'n L'is Obispo	17,595	Tehama	7,414
El Dorado	1,125	Monterey	478	San Mateo	400	Trinity	50
Fresno	2,279	Napa	11,350	Santa Barbara	21,010	Tulare	350
Glenn	12,000	Nevada	3,000	Santa Clara	11,601	Tuolumne	985
Inyo	390	Orange	137,223	Santa Cruz	4,580	Ventura	69,819
Kern	981	Placer	1,685	Shasta	2,406	Yuba	1,900
Los Angeles	140,675	Riverside	7,803				
Total							525,753

NOTE.—The Assessor of Lake County returns the following figures, which are not in the above list, viz.: Under one year, 10,083; under two years, 351; under three years, 32; under four years, 308.

The walnut is generally planted at from 40 to 50 feet apart, and as an average 40 feet would be safe to calculate the acreage of the State. Therefore, allowing twenty-seven trees to the acre, at 40 feet apart, we have in the State 19,472 acres in 1896, as per Assessors' returns, of which 8,814 acres are in bearing, and 10,658 acres are non-bearing.

VALUATION OF WALNUT ORCHARDS.

As indicating the value of a walnut orchard (irrespective of the land or location), the following schedule of valuations, fixed by a convention of Assessors of the southern counties in 1891, is appended:

1 to 3 years planted	$5 00 per acre.
4 years planted	10 00 per acre.
5 years planted	15 00 per acre.
6 years planted	20 00 per acre.
15 years planted	100 00 per acre.

(15) CULTURAL RANGE OF THE WALNUT (*Juglans Regia*) IN THE UNITED STATES.

According to "Nut Culture in the United States," the cultural range of the walnut in the United States is mostly confined to the Pacific Coast, and California in particular. *"East of the Rocky Mountains the Persian walnut has been most successful in a limited area along the Atlantic slope, from New York southward through New Jersey, southwestern Pennsylvaia, central Virginia, North Carolina, and Georgia. The tree endures the winters in favored localities near the coast as far north as Connecticut, Rhode Island, and Massachusetts, but has never been planted there except in very small way. Some very fine old trees are reported from Rochester, N. Y., where they are in old gardens in the suburbs of the city. The finest and most fruitful specimens reported are at Fordham, N. Y., Princeton, N. J., Germantown and Philadelphia, Pa., and Georgetown, D. C., some of these being a hundred years old and bearing large crops of nuts of fair quality."

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*"Nut Culture in the United States." Special Report, Department of Agriculture, 1896, p. 29.

A few trees are mentioned as existing at Marietta, Pa., at Red Hill, Va., at Fall Church, Va., in Delaware, Florida, and the Mississippi Valley, with fair and no success. In Michigan but few trees have been planted, and late experiments in a limited way in Indiana are quite promising, also in Kentucky and Tennessee. In Louisiana a few experiments promise well, but are very limited in scope, and the same is said of Texas. In Arizona the walnut has been planted quite extensively, and from specimens exhibited from there, that territory is bound to become a competitor with California in the walnut trade, and the same applies to Oregon, where the industry is now being pursued. In California the walnut finds the conditions for its culture the most favorable, and the industry is extending annually.

(16) WALNUT-GROWING IN EUROPE.*

By Hon. Eugene Germain, U. S. Consul, Zurich, Switzerland.

In answer to a letter from the Los Nietos and Ranchito Walnut-Growers' Association of California, of June 4th, requesting information about the foreign walnut crop, I said:

> "Switzerland does not grow walnuts on a large scale, but almost every farmer in the valleys has a few trees scattered on his ranch, and principally along the roadways. The annual output is small and some years not sufficient to supply the home demand. In years of abundance, a good article of salad oil is made from walnuts. The trees are hardy and not subject to scale, blight, or other diseases, the only serious enemy of the walnut being late frosts, of which there were none this season. The principal walnut-growing districts of Europe are France, Italy, and Austria-Hungary.
>
> "I will at once take the necessary steps to obtain the information you desire, and within two weeks or so post you, if possible, on this season's crop outlook."

I now beg to inform the association, through the Department, that from reports I have received from the United States Consuls at Frankfort, Vienna, Naples, Bordeaux, Marseilles, Castellamare, and Sorrento, I am able to report as follows:

Walnuts are, to a certain extent, as in Switzerland, grown all over Europe, but in most countries, such as Germany, Belgium, Holland, etc., the yield is small, and some years not sufficient to supply the home demand, the deficit being supplied from the more favored walnut-growing countries. Thus it will be seen that France, Italy, and Austria-Hungary are the only countries raising that article in sufficient quantities for export.

FRANCE.

The French walnut-growing districts are the departments of Dordogne, Corrèze, Lot, and the Grenoble district, in the department of Isère. The Grenoble nuts are of especially fine quality, being of the soft-shell variety, large, white meat, and running uniformly. These nuts yield the grower from 93 to 105 francs per 100 kilograms (about 8 to 9.18 cents per American pound). The latter price is for Grenoble nuts.

The crop in France this year is good. It compares favorably with former years, and is as good as in 1895. The 1895 crop was above the average, and that of 1894 below.

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*Consular Report No. 192, pp. 149-151, September, 1896.

The principal points of export for France are Bordeaux, Marseilles, and Havre.

The trees in France are not subject to scale, blight, or other diseases. The orchards are mostly small and owned by farmers.

ITALY.

The Italian walnut-growing districts are the Neapolitan provinces around Naples, Castellamare di Stabia, and Sorrento. The points of export are Naples and Sorrento.

In Italy, this year's crop compares favorably with former years. Last year's (1895) crop was one fourth less than a medium crop and somewhat inferior to the average.

The principal growing district is Piassio di Sorrento. The trees are, to some extent, owing to climatic influences, subject to scale and blight diseases. The walnuts bring on an average $9 25 per 100 kilograms, or from 4¾ to 5¼ cents per American pound. The extent of orchards is the same as in France.

AUSTRIA-HUNGARY.

The walnut-growing districts of Austria are in the lower part of the empire, or what is known as "Nieder Oestreich." In first line, comes what is known as the Steiermark, where the crop is a medium one; second, Mähren, a good crop; and third, Bosnia, where the crop prospects are excellent. Last year's crop was a light, medium one in the above-named districts, and the nuts, as a rule, are poor, not well filled, small, and of the hard, thick-shelled variety. In Hungary, the districts of Nagy, Bánya, and Grosswardein produce an excellent nut of good quality, large, white meated, and well filled, and, as my informant tells me, compares favorably with the French Marbeaux nuts. No figures as to prices are given.

The point of export for Austria-Hungary is Trieste.

Trees are hardy and not subject to diseases, as scale, etc.

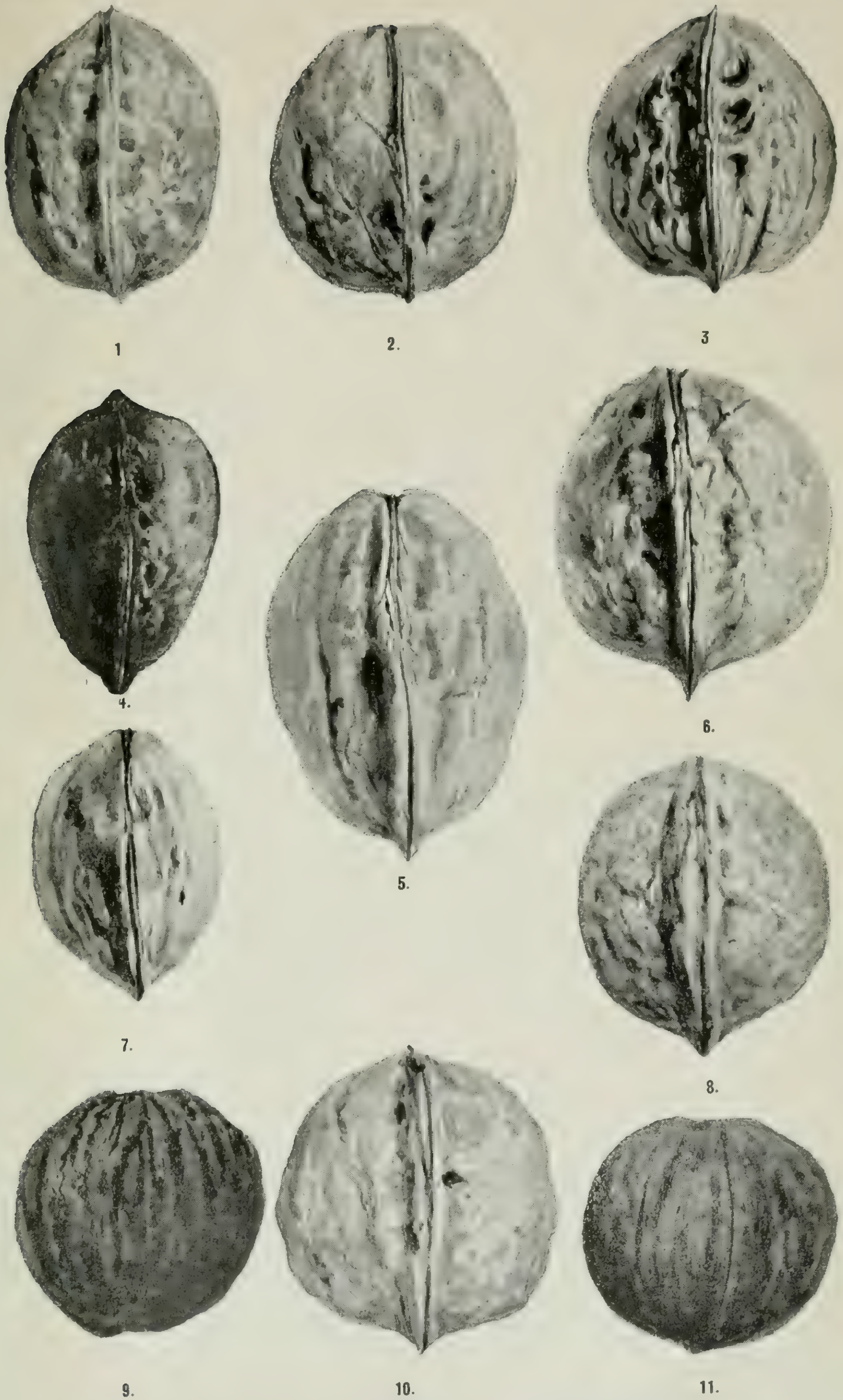
WALNUT EXPORTS TO THE UNITED STATES.

In order that the California walnut-grower may know where he has to look for competition, and what quantities of walnuts are exported to the United States, I have copied and give below the points of shipment and the declared values of walnut exports in dollars (I am unable to get figures as to quantities) to the United States for the last two quarters of the years 1894 and 1895, these being the periods of the year in which walnuts are gathered and shipped, and as given in the United States Treasury returns for the above-named years:

Whence Exported.	1895.	1894.
French.		
Havre	$50,832 39	$12,281 00
Bordeaux	156,579 01	82,282 00
Grenoble district	58,886 00	52,788 00
Marseilles	73,584 00	174,445 00
Italian.		
Castellamare di Stabia	2,624 43	71,809 32
Naples	10,256 00	19,755 85
Sorrento	34,076 00	None.

Austria-Hungary is not credited with any walnut export to the United States. The only other country growing walnuts which exports them to New York and San Francisco that I know of, is Chile. These, as a rule, reach New York and San Francisco in the month of August, and the only data I can find in the United States Treasury returns as to the walnut export from that source is that contained in the returns for the quarter ended September 30, 1894, in which Chile is credited with an export figure of $5,844 48 for that year. No figures are given for 1895, and I presume no walnuts were received.

ZURICH, July 14, 1896.



Juglans Regia, Juglans Nigra, and Juglans Sieboldiana.

EXPLANATION OF PLATE XXI.

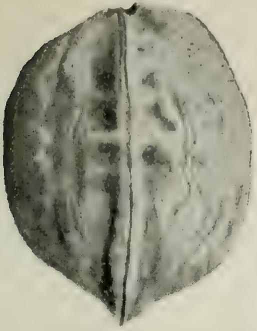
THE WALNUT.

1. California Paper-Shell.
2. "English" (so called).
3. Mayette.
4. Japanese (*J. Sieboldiana*).
5. Franquette.
6. Ford's Improved Soft-Shell.
7. Cluster.
8. Rivera Soft-Shell.
9. American Black (*J. Americana*).
10. Improved Soft-Shell.
11. California Black (*J. Californica*).

EXPLANATION OF PLATE XXII.

THE WALNUT.

1. Fertile.
2. Mobart.
3. Serotina (St. John).
4. Gant (Syn. Bijou).
5. Grenoble.
6. Ford's Eureka.
7. Rivera Hard-Shell.
8. Prœparturiens.
9. Charberte.



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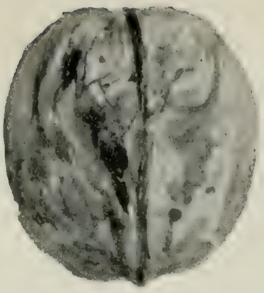

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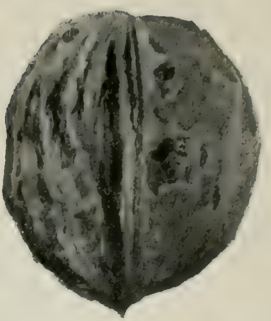

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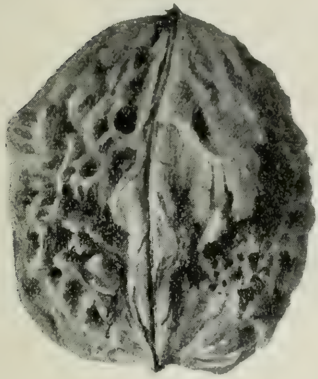

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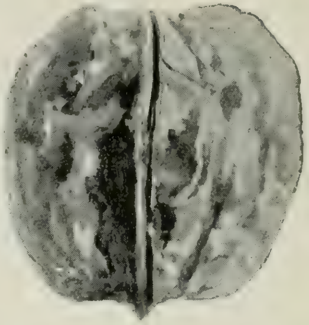

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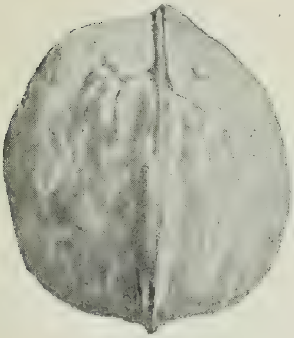

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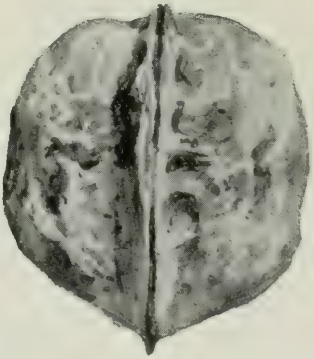

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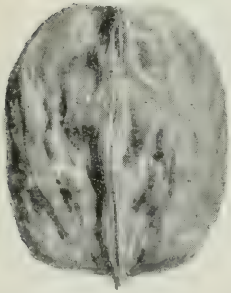

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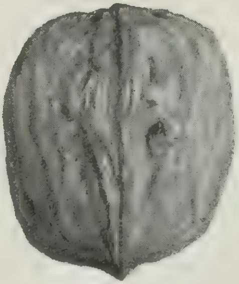


9.

Juglans Regia.

PRUNING THE PRUNE.

BY

S. P. SANDERS, - - - OF SAN JOSÉ.

XIV.

PRUNING THE PRUNE.

Prepared by S. P. Sanders, of San José, at special request.

The French prune (Petit d'Agen) is a tree naturally erect and a symmetrical grower, having one main center stem, from which side branches put out at varying heights along the trunk, never two opposite each other; but, taking any given limb to start with, the next above it (if every bud starts) will be one sixth of the way around the trunk, and the sixth will be directly above the first. The limbs come out at nearly right angles with the trunk, and always have support from the wrinkled and knotty enlargements at their base. Thus, however thick and bulky the trunk may become, the side limbs that put out when the trunk was only the size of a whipstock, are found reaching from the very pith to the outer bark as a hard knot. The limb stands in the same position to uphold weight as a nail driven into a post, to hang your coat upon. The limbs, set at a right angle in the trunk, soon take an outward upward curve, and finally grow nearly erect, forming, with the center stem, which is always highest, a graceful cone.

I wish to show the agricultural design of a tree best adapted to sustain itself through the ordeal of bearing a crop of well-developed and fully matured fruit, and then be in proper form to repeat the effort year after year.

Object of Pruning.—The manner of training a prune tree is not merely a matter of fancy. Most people want it to bear fruit for revenue. It does not fill its mission if it is trained to form a thick, bushy top (Plate XXIII, Fig. 1), that shuts out the blessed sunshine from the small twigs and short spurs that grow on the limbs lower down. They would bear fruit and remain a permanent asset of the tree, but being deprived of sunshine, they perish and fall away without ever bearing a prune, leaving the main limbs naked, and putting the duty of bearing all upon the twigs which have struggled outward to find the sunshine. Neither does the tree fullfil its mission if it is allowed to break down or split apart when its crop is half grown, for the fruit, being thus arrested in its development, lacks some essential element, and turns out, in curing, bloated fruit, what are termed "frogs," also small, tasteless, inferior prunes, of which it will take a hundred to a hundred and eighty to weigh a pound.

When a tree is in good bearing it may be shortened in, if necessary, to gratify one's taste for symmetry, but if no radical changes are made, the tree will thenceforth distribute its energies so wisely that while it is maturing a moderate crop of fruit, it will also be extending its spurs and decorating them with buds of promise of future bearing. Some orchardists think it profitable to clip back in detail the new growth on bearing trees, and some even to thin the clusters of fruit, but it seems hardly practicable to do one or the other in large orchards.

Shaping the Tree.—If the seed could be planted where the orchard tree is wanted, and the prune graft inserted into the seedling at the crown of the root, and allowed to make its growth unmolested, the tree, at four years of growth, would be in form nearly as described above—a graceful cone. The main limbs would be studded with twigs and spurs, which in turn would be set with fruit buds, and the orchardist's heart would be made glad in the promise of a crop in the fifth year. It would be wise, however, to tend the young tree and not allow more than six main limbs to remain, and these spaced along the trunk, the lowest one two and a half feet above the ground, the next one six or eight inches higher and a quarter way round the trunk, observing the same system with the other limbs, until the five or six limbs that are allowed to remain are located, each one clearly in possession of its rightful share of the parent stem, and none interfering with the equal rights of the others.

A tree thus started, and not cut or distorted, will, at the age of five years, begin to bear fruit. A photograph accompanies this paper showing such a tree (Plate XXIII, Fig. 4), one of a large orchard that has never been pruned. The trees, however, were grown in nursery and transplanted, instead of growing from the seed where they now stand. The natural setting of the limbs is plainly seen. Perhaps there are too many of them, but they will bear up without breaking or splitting away with any weight of fruit they will ever have.

A Common Practice.—Very seldom is an orchard seen in which the trees have been allowed to grow in their natural form. (Plate XXIII, Figs. 3 and 4.) The common practice has been, after setting an orchard of yearling trees which are whipstock size, to cut the stem off at from a foot to eighteen inches from the ground, thus destroying forever the plan of maintaining a center stem, but compelling all the limbs to grow in a cluster; and howsoever many may be allowed to grow they all shoot straight up, forming sharp and weak crotches which are easily split when the tree is large enough to bear fruit (Plate XXIV, Fig. 1), for then the limbs begin to lean outward under their weight of foliage and fruit. The power exerted by a constant downpull of hundreds of pounds of limb, foliage, and fruit, on the end of a ten or fifteen-foot lever, is vastly out of proportion to the resistance offered by the union where they spring from the trunk and are held together by a mere tissue of bark. The mischief was only begun when the yearling tree was cut back to a foot from the ground, for thus started it has been kept growing in the prevailing fashion, which dictates that the following year's growth must be cut back at least two thirds.

Wherever a limb is cut off you multiply by three the limbs in the following year's growth. There is scarcely an orchardist who will not, by the third year, be convinced that his trees are becoming too thick in the top, so he will begin to subtract, by taking out some of the tines of the forks formed by the two years of cutting back, yet cutting back the ones that are retained, thus multiplying by three again a little higher up. It is not uncommon, in an orchard modeled on this plan, to find trees (Plate XXIV, Fig. 2) which, at a level of five feet above the ground, have as many as twenty-five branches, and as many as thirty-seven have been noted.

Cutting Back Young Trees.—If young trees are cut back, they will resent the treatment by doubling their effort in growing to repair the damage done. It is a mistake to suppose that you can throw the growth into the trunk or roots, or make sturdy limbs by cutting back. It is demonstrated by actual measurements that trees, at any period of their growth, not cut back, are larger than trees under exactly like conditions that have had their "annual shearings"; besides, by cutting back, the fruiting year is put afar off. Leave the trees severely alone, merely cutting out the vagrant growth, until they have gratified their ambition to become trees, and have "declared their intentions" of bearing by setting with fruit buds; then, if the twigs have formed too thick a network and are well studded with fruit buds—not till then—shorten them. Do not destroy them, nor let the limbs above destroy them by casting too dense a shade on them.

Results from Overburdened Trees.—Observations made by the University Experiment Station seem to point out that small, undeveloped prunes, and tough-skinned "frogs," come from overladen trees. Prunes from broken limbs of overladen trees make the poorest showing of any examined; those from the same tree, but from unbroken limbs, were but little better; that is, they all were under-developed, all were small, and gave the largest percentage of "frogs" in curing.

A tree may yield less than a hundred pounds of fruit and yet be overloaded. On account of lack of moisture, cultivation, or of food which it can assimilate, the fruit may be pinched and tough; but given a tree in good soil with sufficient moisture, carefully conserved by cultivation, yet breaking down under its weight of fruit, that tree is pleading for relief and should be severely thinned in the top, to that extent that will enable it to plump out its fruit with delicious pulp (Plate XXIV, Fig. 3), under a tender skin, which will easily crinkle in a weak, scalding solution of lye, will cure readily in the sun, and when finished will take from forty to seventy to weigh a pound.

The breaking of limbs, inferior size of fruit, resistance to the action of lye, and consequent tendency to "frog" in curing, are all directly traceable to overbearing.

To Prevent Overbearing.—Is it better to avoid all these troubles by relieving the tree of part of its task, and by so doing get a smaller crop of better fruit, and extending its useful life indefinitely, or is it better to crowd the tree to its utmost capacity now, regardless of its length of life, and try some method of masking the inferiority of its product, such as pricking the prunes to disguise the frogs?

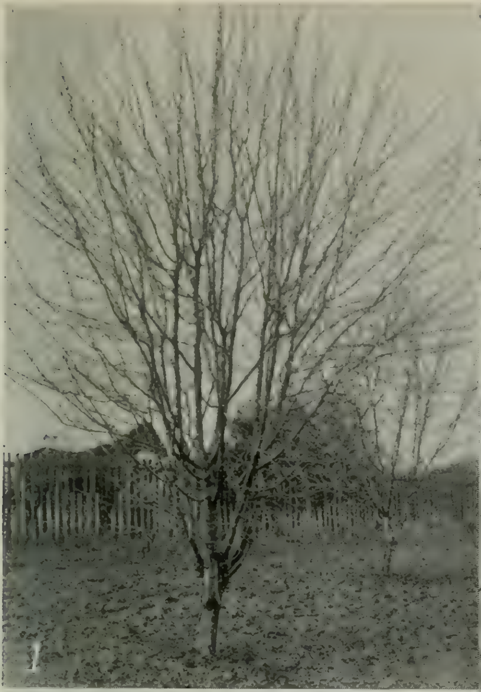
Repairing Old-Style Trees (Plate XXIV, Fig. 4).—The practice of heading prune trees low and allowing a cluster of limbs to shoot from one common head, then cutting back from year to year, thus multiplying the limbs, has happily gone out and better systems now prevail. The mistake made, however, is not fatal nor entirely beyond repair. No doubt it shocks a tree to cut severely among its larger limbs, but heroic treatment is sometimes necessary, and it is better to reduce the bearing wood to the upholding capacity of the limbs, so that the clumsy and troublesome ropes and props can be dispensed with. Several devices are used to prevent splitting in the crotch, such as bolting through the trunk and across through the butts of opposing large limbs. Bale ropes may be used high up among the limbs to prevent them leaning away outward (Plate XXIII, Fig. 2), but ropes are short lived, require attention often to prevent strangling, or cutting the bark, and may give way at the critical time when most needed for support. A better plan is to use quarter-inch smooth fence wire, which has been toughened in the fire. Bore with a five-sixteenths inch bit through opposing limbs, where engineering skill says it will do the most good. Cut off a wire the right length to reach and protrude an inch and a half at each end, bend the end down, taking care to leave the hook lying lengthwise the wood. If it is necessary to strain a limb upward out of the team's way, put a leather strap having a ring at each end under the limb and use a rope with a hook and pulley to draw it up to the position where it is to be held by the wire. A rope used around the limb in raising it would wound the bark. The limb should be raised to the position where it is to be held by the wire before boring. In a short time the wire is grasped lightly by growth in the limb, and becomes a permanent fixture. It will not wear out nor rust away. Besides, iron is good medicine.

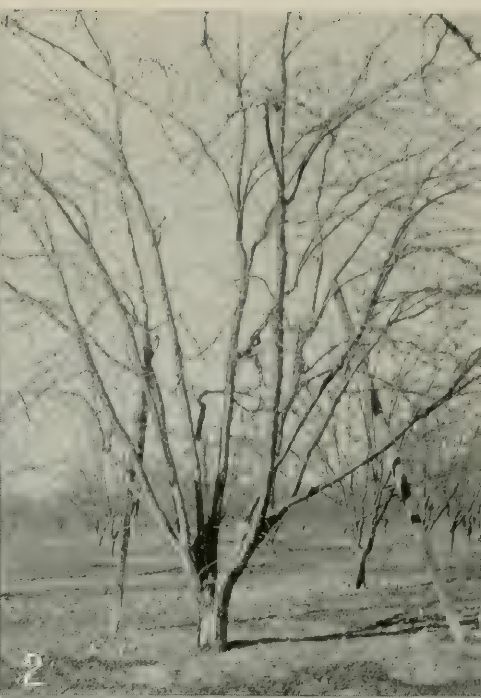
Thus, however much we may deplore the misshapen and ungainly appearance of these old trees, we may hold them together by mechanical contrivances and gather many crops of well-developed prunes, if we will further observe three cardinal points of care, which are: Feed the trees, cultivate the soil, and keep the bearing wood reduced so that the trees are not overburdened with fruit.

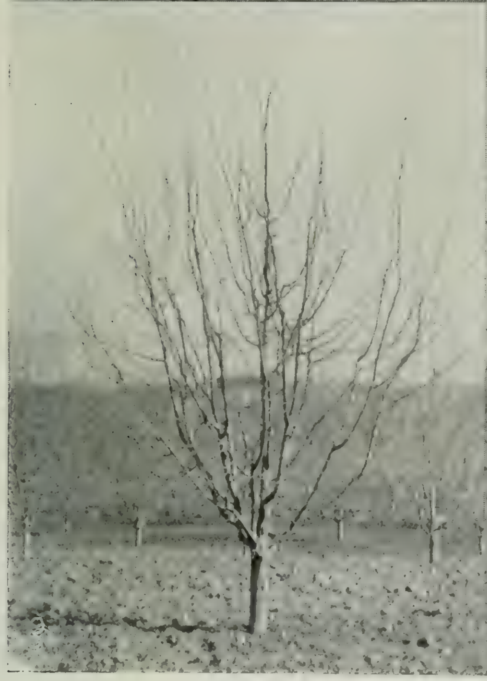
Illustrations.—The camera "doth nothing extenuate nor set down aught in malice," and by its aid I am able to show some trees of approved style, as well as some of the crippled ones. In getting the pictures it was too late in the season to show some of the trees in their saddest plight, for the broken limbs had mostly been removed, but nature has had her revenge, and they will not be likely to break again under a load of fruit for some years to come. They might have been saved for years of useful bearing by cutting away some of the forks and laterals in the top, thus removing a part of the weight from the ends of the long levers, reducing the burden to the capacity of the limbs, both to sustain the weight of fruit and convey the supply of nourishment for its development.

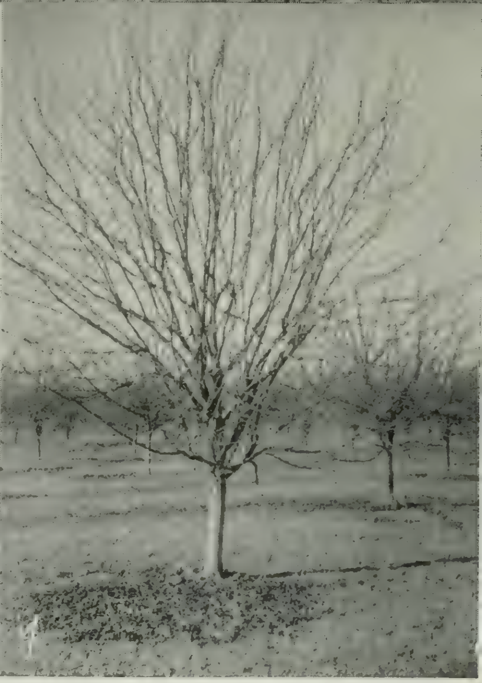
PRUNING THE PRUNE (*P. d'Agen*).

PLATE XXIII.



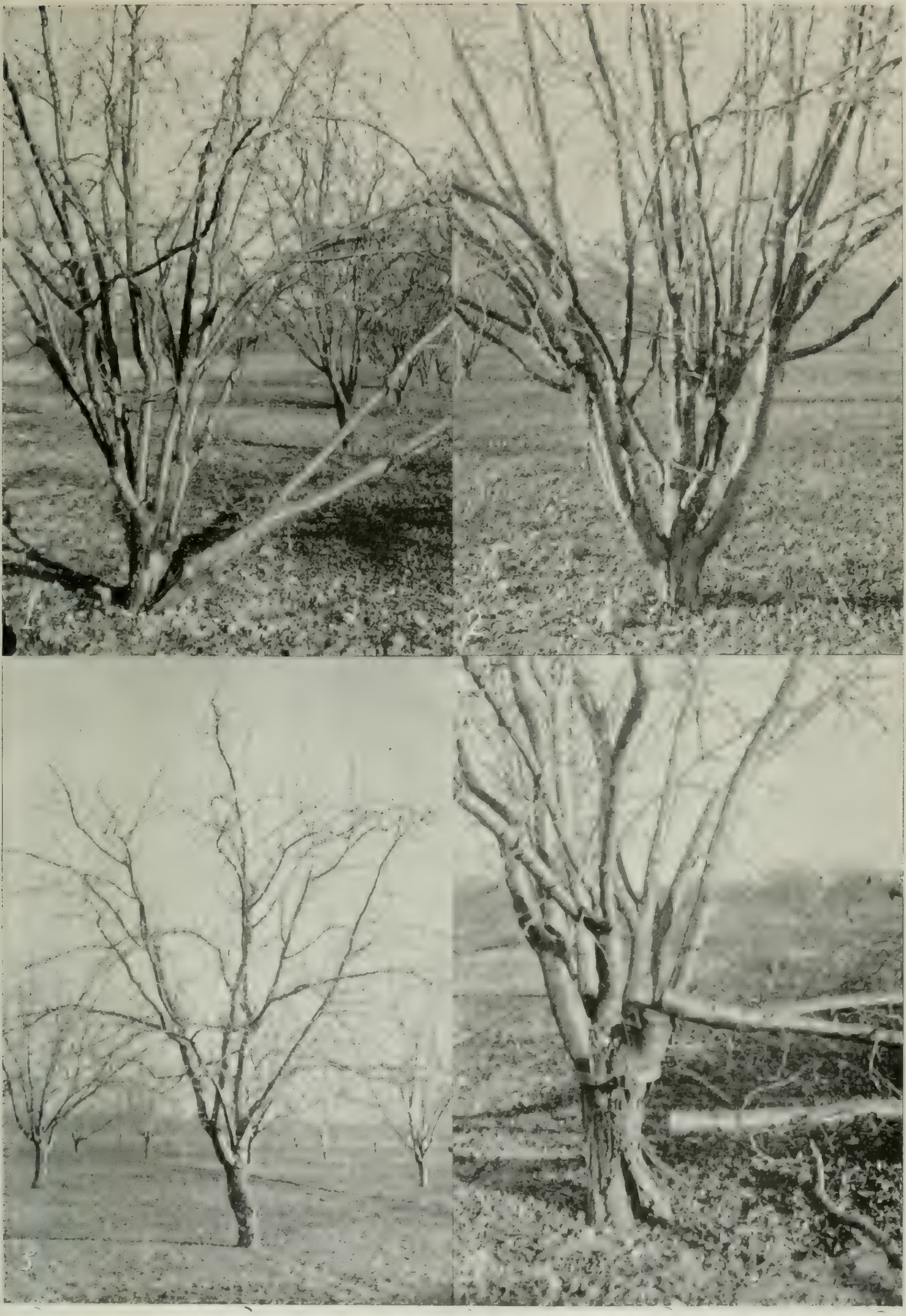






1. Too thick at top; has not borne yet.
2. One-third split; held by ropes and props
3. Tree well started.
4. Naturally formed tree; has never been pruned.

PRUNING THE PRUNE (*P. d'Agen*). PLATE XXIV.



1. Tree badly started; breaking away.
2. Tree badly started; kept from breaking by means of ropes.
3. Well-trained tree; sufficiently thinned.
4. Mode of holding limbs together; not recommended.

REPORTS

OF

ALEXANDER CRAW,

Quarantine Officer and Entomologist.

XV.

ENTOMOLOGY AND QUARANTINE.

REPORTS OF ALEXANDER CRAW,

Quarantine Officer and Entomologist of the Board of Horticulture.

To the Honorable the State Board of Horticulture:

GENTLEMEN: Since my last report (April 16th) seventy-two steamers and sailing vessels arrived in the port of San Francisco, having on board trees or plants. During the summer months importers receive very little stock from foreign countries, as the plants dry out more rapidly. Plants and trees during that time are brought in pots or balled, and that adds to the weight and expense. Tourists having but a few ornamental plants prefer them in pots or vases, as they can water and attend to them on the voyage. With the exception of araucarias, from Australia, very little nursery stock has been received.

The small, soft convex scale, resembling a *Lecanium*, but differing in having a margin of pink hairs or spines, found upon ornamental plants from Mexico, and referred to in my last report, has been kindly determined for me by Prof. D. A. Cockerell, of Las Cruces, N. M., as *Planchonia fimbriata*. The spiny scale upon ornamental plants from Hawaii, he named *Asterolecanium pustulans*, and considers it a particularly pernicious species.

On the steamship "Alameda" that arrived from Australia on July 3d, two members of the crew had six palms obtained at Samoa, infested with *Chionaspis citri*, and one with *Aspidiotus rossii*. The latter scale resembles *Aspidiotus ficus*, the red scale of Florida, but is larger and darker. It also differs in having a grayish-brown exuviæ with black center. This scale is a very general feeder in Australia. The palms were destroyed.

On July 5th, a passenger on the steamship "City of Rio de Janeiro," from Japan, had three orange trees—in bearing—that were infested with three species of destructive coccids. These were the serious orange Chionaspis (*Chionaspis citri*), the long scale (*Mytilaspis gloverii*), and the wax scale (*Ceroplastis ceriferus*). The former species was the most numerous. I destroyed the trees; also seven variegated euonymus infested with *C. euonymi*, belonging to the Chief Steward.

On July 27th the steamship "Australia" arrived from Honolulu. A passenger had a number of plants, five of which were "papaws" (*Carica papaya*), that were infested with a new scale, *Lecanium longulum*, Douglass. Plants were destroyed.

On August 21st, a passenger brought six ferns from Honolulu that were infested with the "red wax scale" (*Ceroplastis rubens*). I destroyed the plants.

In writing to Hon. J. Marsden, Commissioner of Agriculture of the Hawaiian Islands, I mentioned the receipt of this scale. In reply he said: "The *Ceroplastis rubens* is present all over Honolulu, and affects a great variety of plants, but appears to do little or no damage. Mr. Koebele says that in Australia it does much injury to the Mango trees, but he thinks there is a parasite here that keeps it in check. The ferns you mention were taken by private parties. I have sent many things to California from our Government nursery. We take every care to have the plants clean at the nursery."

On August 25th, a warden case containing economic plants, spices, etc., arrived on the steamship "Peru," in transit from India via China to Honolulu. The case was marked S. L. J. & Co., San Francisco. Upon inspection, I found the plants in bad order, and infested with three species of *Aspidiotus*. I wrote to Mr. Marsden as to their condition.

September 21st, the "Gaelic," from Japan, had a vase of Pandanus plants for a lady of San Francisco, that were infested with a new scale, *Ischnaspis filiformis*. This scale is very narrow and dark, and resembles a *Mytilaspis*. The plants were destroyed.

September 26th, the steamship "Alameda" arrived from Australia and New Zealand. A passenger had five Fourcroyas infested with red scale (*Aspidiotus aurantii*). The plants were not fumigated, as they were intended for a section of the State where this scale is not found, so I destroyed them. On the same steamer was received a case of orange and persimmon trees for S. B. Heiges, Division of Pomology, Washington, D. C. The orange trees were not in good shape after their long voyage and were slightly infested with *Aspidiotus aurantii* and *Chionaspis citri*. I wrote to Prof. L. O. Howard, of the Division of Entomology, Washington, D. C., as to their condition, and he replied that the matter would be attended to. The surgeon of the "Alameda" brought two small orange trees in pots; upon examination, I found two male scales of *Chionaspis citri* upon one of the trees, but could not detect any females. As the trees were a new variety (Beauty of Glen Retreat Mandarin), I had them fumigated with hydrocyanic acid gas, and passed.

On October 19th, the steamship "Willamette Valley" arrived from Mexican ports with five hundred and five boxes of oranges from La Paz, which were slightly infested with long scale (*Mytilaspis gloverii*). They were quarantined as soon as landed on the dock. The owners agreed to have them fumigated, which was very effectively done with cyanide of potassium and sulphuric acid.

Scales and some of the insects referred to in my previous reports have been found and destroyed. As formerly, the most of the plants came from Japan. The following countries have also contributed: China, India, Australia, New Zealand, Samoa, Tahiti, Washington Island, Marquesas, Sandwich Islands, Central America, Mexico, and British Columbia.

Through the courtesy of the Southern Pacific Company we are notified of the arrival of plants by rail from outside of the State.

Probably the most troublesome insect during the past season has been the codlin moth. Complaints have been received of the failure of Paris green as a remedy for this pest. This has been so general that it would lead one to suspect adulteration. I would therefore suggest that the

Board officially ask the principal manufacturers to put up their Paris green for spraying purposes in sealed packages, of from one to ten pounds. This would prevent its adulteration with chrome green by unscrupulous retailers. I have prepared a short paper upon this subject.

An Eastern insect has been reported from two counties, San Mateo and Madera. It is a species of *Tingis*, and affects the trees in the same manner as aphis, by inserting their beaks and sucking the sap. In the former county they were found upon the leaves of the native wild cherry (*Cerasus aquifolia*), and in the latter county were found upon poplar trees. When full grown they measure one eighth of an inch in length, with broad, transparent, reticulated wings. They attack the under side of the leaves, causing them to become brown, with numerous small, gummy, black specks on the under side. In the East they attack hawthorn and apple. Three lots have been submitted to me upon apple leaves from Oregon. The same remedies that are applied for aphis will destroy them. All dry leaves and rubbish in infested orchards, or under infested trees, should be raked up and burned during the winter to destroy any hibernating females or eggs.

"Fuller's rose beetle" (*Aramigus fullerii*) has been found all over the State for over twenty years, but was never considered a serious pest. The past summer, however, they appeared in greater numbers and did some damage in cutting the edges of orange, lemon, laurestinus, and other trees and plants. Geo. A. Compere, Horticultural Inspector of Los Angeles, discovered the larvæ feeding on roots of chrysanthemums. In districts where this beetle has been troublesome the roots of those and similar plants should be examined during April, May, and June, and if the white grubs are found the plants should either be destroyed or treated with strong soap-suds. The beetles work mostly at night, and when disturbed they fold their feet and drop. By spreading sheets under the trees and jarring the leaves with a switch, the orchard could soon be cleared of them.

Notice of a new scale insect, discovered in San Bernardino, was recently published. As it was the same species (*Pulvinaria psidii*, Maskell) that I have occasionally found upon plants from the Sandwich Islands, and destroyed, I wrote to Mr. Samuel B. Parish, asking for an account of its introduction. In reply he said: "It was first observed by me in 1893, on a tree (plum) six or seven years old. It was one propagated by myself and grafted with wood from an old tree on my own place, so that the scale did not come to me on nursery stock. It had probably been on the tree a year or two before I noticed it, as it was then abundant. I at once dug the tree up and burned the wood. In 1894 it appeared on two or three nearby trees, and the present spring on the same trees and on one additional one. I then took them in hand and sprayed four times, at intervals of ten to fifteen days, with kerosene emulsion, very thoroughly applied. I have seen none of them since. Where they came from is quite a puzzle. I had not had any trees or plants brought on my place for two or three years before their appearance."

Mr. Parish has promised to notify me if they again show up. When in the larval state this family of scale insects look like small *Lecaniums*. Next spring, at the time they show the cottony secretion, a thorough search will be made by the inspectors to see that it has not spread to, or is to be found in, adjoining orchards or gardens.

I have received from Ventura specimens of twigs taken from an orange tree received through the mail, two years ago, from Florida. It was badly infested with "chaff scale" (*Parlatoria Pergandei*). I recommended its destruction and a thorough inspection of adjoining plants or trees.

About the 20th of April last, Mr. George C. Roeding, of Fresno, received from Smyrna a shipment of wild or capri figs, that may yet solve the question of the successful introduction of the fig wasp (*Blastophaga*). The figs were winter or immature fruit of the previous season that remain attached to the shoots until the following spring, when they develop. He sent me two fruits, with the request that I suggest some method whereby he could successfully breed the insects. Upon examination, I found the larvæ just about to change to the pupa state, and all in good order. The presence of the *Blastophaga* in those dormant figs suggested to me the advisability of importing the shoots with the figs attached, instead of the detached fruit, and upon receipt thereof to have them grafted into bearing fig trees in the orchard, or upon small trees in pots in a hothouse. In this way the figs will mature and produce pollen about the time the insects hatch, and the cultivated figs should be fertilized. Mr. Roeding has been untiring in his efforts to introduce this useful insect. Success will mean the production of superior flavored figs in California, and possibly prevent the souring or fermentation that sets in so rapidly about the time the fruit is ripe.

The past season has more clearly demonstrated the wise policy you are pursuing in introducing, propagating, and distributing beneficial insects to the orchardists of the State. As per your instructions, I sent out the "black ladybird" (*Rhizobius ventralis*) during the latter part of May and early in June. Mr. Cooper's orchards, at Ellwood, are practically free from black scale, so there were no *Rhizobii* to be had there. Through the courtesy of Mr. E. W. Harrold, of Saticoy, I was granted permission to collect these insects in his orchard. Nearly eight hundred colonies, each averaging four dozen beetles, were sent to different parts of the State, and with very few exceptions reached their destination in splendid condition. As they were liberated at the same time of the year that Mr. Cooper made a success of the colony he received from Mr. Koebele from Australia, I believe that more satisfactory results will be obtained from this distribution. It was nearly eighteen months before they showed up in numbers at Ellwood, and two years later Mr. Cooper's orchards were clean. The first colonies were sent out from Ellwood in September, two years ago, and now we are receiving letters that the *Rhizobii* are showing up in districts where it was feared they were going to be a failure. I am in receipt of a letter, dated October 11, 1895, from Mr. Alfred Wright, of Pomona, wherein he says:

> "Your favor of the 8th at hand, making inquiries in regard to *Rhizobius ventralis*. About two weeks ago, during a warm spell, Mr. S. A. Pease, the inspector, came over, as he is very anxious, as well as myself, that they will be a success. We went all over the orchard and could find them everywhere and in all stages, and I am certain we could have taken at least a thousand off the trunks of some trees. We could see the larvæ crawling up and down the trees, and also found the pupæ. My orchard never made a better growth than this year, and will have quite a good crop of olives."

The following from the "Press and Horticulturist" of Riverside, September 28, 1895, would indicate that they have got a good start there:

> "Horticultural Commissioner Havens having reported that the *Rhizobius* was to be found in great numbers on the Coombs place, opposite the home of L. C. Waite, where

they had been placed a year ago, a reporter went to the orchard and made an examination. Not only were the *Rhizobius* found by the thousands, but they were found on every tree in the orchard and working away like little beavers. So industrious has been their work that but little of the black scale remains in what was a pretty badly infested grove. They were found in greater numbers on the orange trees than on the olive trees surrounding the block. A new discovery was made, and that was that the beetles were coming from the ground, and just at the base of the trees there were thousands of them, but all those moving were going up the trees. Whether they had been driven into the ground by the heat of the day, or made their home just under the soil, is a question, the one thing of the trees being covered with their larvæ tending to show that the beetles had been driven to the soil by the excessive heat of the day. It is certainly demonstrated beyond question that they have multiplied almost without number, and that they are doing good work in destroying the black scale.

"Mr. Havens is naturally very much gratified, not only because he has been a strong advocate for giving the beetles a chance, but over the fact that there is a good promise of the destruction of the scale by these little parasites. If there are any doubting Thomases they should visit this grove. The *Rhizobius* could hardly be thicker in the Cooper orchards at Santa Barbara."

On June 3d, with County Commissioner John Scott, of Los Angeles, I visited Inspector William Evans' orange grove at Downey, where we found the *Rhizobius* breeding very satisfactorily. A strong colony was collected for the foothill orchards near Duarte.

Inspector Rowland Machin, of the Glendale district of Los Angeles County, was delegated by Judge Erskine Ross and Captain C. E. Thom to visit Mr. Harrold's orchards and collect colonies for their extensive citrus orchards at Glendale. Upon his return, Mr. Machin constructed a number of tents with scantlings and fine cheese cloth, each inclosing an orange tree. Into each he placed a strong colony of *Rhizobius*, and as soon as they begin breeding he intends removing the cloth. In those orchards a species of large black ant was plentiful, that attacked the ladybirds and drove them away. We protected the trunks of the trees with barriers to keep the ants down until the ladybirds deposited their eggs; after that the ants would get accustomed to the young larvæ and probably not molest them. With Mr. Machin, I visited Mr. Waddington's orange grove between Glendale and Burbank, and we found the beetles breeding, and a few had spread to adjoining trees.

On July 10th, with Mr. Lelong, I visited Dr. Edwin Kimball's orchards at Haywards, Alameda County, where colonies of *Rhizobii* had been liberated two years before. Upon his orange, lemon, and prune trees we found both beetles and larvæ of *R. ventralis* and *R. debelis*, and his trees very much improved. His apricots were clean this season, the first time since the black scale attacked his trees. In the same orchard we found the *Vedalia cardinalis* and *Novius Koebelei* preying upon *Icerya* on lemon trees.

We have also received encouraging letters from other sections.

In order to protect the *Rhizobii* in deciduous orchards during the winter and before the leaves drop, I would suggest tying bunches of inverted corn-husks, or leaves, upon the branches, into which they can retreat at night or during wet weather. In this way they will be found present in the orchard in early spring, and so get a good start.

Strong colonies of *Rhizobius debelis* and *R. toowoombæ* were collected upon walnut trees at Ellwood, and sent to different sections. They feed upon "pernicious scale" and aphis.

During May, the "steel-blue ladybirds" had increased to such an extent at L. N. Kercheval's orchard, in Los Angeles, that Mr. Kercheval published a notice in the daily papers, inviting orchardists having red scale (*Aspidiotus aurantii*) to visit his place and secure colonies. They were very plentiful when I visited the orchard, and we found they had spread slightly to adjoining orchards. I think that when they become better acclimatized their increase will be more rapid.

The minute ladybird (*Scymnus nanus*), referred to in my report of August 15, 1894 (and printed on page 437 of your report for 1893–94), found feeding upon "red spider" in the orange and lemon orchards of Rivera, Los Angeles County, had done their work so well that but few spiders could be found this season, and consequently but very few of this little ladybird were to be found during my visit in June last. Mr. Scott, later on—besides distributing colonies in his county—kindly collected a number of strong colonies at my request, and sent them to different sections of the State. I hope they will become established and spread from those centers.

The mealy bug ladybird (*Chryptolæmus montrouzieri*) has bred freely in confinement the past season, and a great many colonies were sent out; also very strong colonies of its co-worker, *Hyperaspis lateralis*, to districts where mealy bugs (*Dactylopius*) were found. Mr. John Scott received several colonies for different districts, and in a letter dated October 12, 1895, says:

> "I was agreeably surprised yesterday, when I went to Monrovia to place the colony of *Chryptolæmus*, to find that the *Hyperaspis* was working well. I found larvæ in the tree in which I placed the colony, and also in trees forty yards away a great quantity of the mealy bug is destroyed. I forward some for feed by express (prepaid), but not as much as I had expected; the large nests that I found a week ago are almost all eaten up."

G. W. Harney, of Yuba County, found the small Eastern ladybird (*Pentilia misella*) in great numbers in an orchard infested with "pernicious scale" in the foothills of his county. This species has been reported by Prof. L. O. Howard, of Washington, D. C., to be found preying upon the same scale in the Eastern States. Mr. Harney also reports that the internal chalcid parasite, *Aspidiotophagus* (*Coccophagus*) *citrinus*, is well established at Marysville on the yellow scale of the orange, and is doing good work.

We still propagate the *Vedalia cardinalis*, *Novius Koebelei*, and *Chryptolæmus montrouzieri* indoors, so as to be able to promptly supply all applications for them.

I would go more fully into this subject, to sustain your advocacy of this method of combating destructive scale insects, but time is rapidly proving that your policy has been wise and correct. We do not look for, nor have you ever stated that we can secure, complete extermination of our orchard pests by parasites; but who in California now fears the heretofore destructive "cottony cushion scale," the "pernicious scale," the "yellow scale," the "cottony grape scale," the "soft orange scale," the mealy bugs, and we soon can add all the *Lecaniums* to the list? All of the foregoing have been destructive in their time and have been regarded with dread by orchardists. With a more rapid breeder for "red scale," and the cleaning up of the purple scale, where it has been found, with hydrocyanic acid gas, we have not so much to fear in California. Of course, with the disappearance of their food, the parasites naturally disappear and the scale may show up again, but colonies of beneficial insects can again be liberated and clean them out.

Doubts have been freely expressed, in writing, by several prominent entomologists to orchardists and planters, as to the wisdom of relying too much upon parasites, but the work of the ladybird *Chryptolæmus* in the coffee plantations and orange orchards of the Sandwich Islands is as great and quite as rapid as the *Vedalia* and *Novius* were in California. In a letter to me dated September 4, 1895, from the Hon. J. Marsden, Commissioner of Agriculture, at Honolulu, he says:

> "The *Chryptolæmus* has done wonderful work on these Islands; it has not only entirely cleaned out a *Pulvinaria* that threatened the total extinction of our growing coffee industry, but also a serious blight *Dactylopius albizzii* [a species of mealy bug] that was destroying all our citrus trees. The *Chryptolæmus* bred to such an extent that ground and fences were covered with the pupæ, and looked as if we had had a snowstorm. Now it is seldom that any of the scale can be found, and the citrus trees are bearing good crops this year."

The above would seem to refute the following statement, recently made by one of the foremost entomologists of the day: "The ideas of the value of natural enemies which have become prevalent since the introduction of *Vedalia cardinalis* from Australia into California, to feed upon the fluted scale, are in a measure exaggerated, and it is not likely that another equally successful instance of the practical handling of natural enemies will soon be brought about."

Of course our climate and that of the section where the writer of the above resides, are not to be compared, and this has something to do with our success. We feel encouraged, and all disparaging statements will have no depressing effect upon us, in our search for more natural enemies. A gentleman that stood high in his profession remarked to me that "he did not believe in the indiscriminate introduction of beneficial insects, as they would only supplant our native species." As the latter had not shown that they were capable of keeping the destructive imported ones in check, I could not see that any harm would result, as such insects themselves cannot become a pest.

I again desire to express my appreciation, and thanks to the heads of departments and officers of the custom service, also to the various dock officials, for their valuable assistance in my quarantine duties. To Mr. Charles Fuchs, of this city—an acknowledged authority upon *Coleoptera*—my thanks are due for his kindness in determining various specimens referred to him.

Respectfully submitted.

ALEXANDER CRAW,
Quarantine Officer.

San Francisco, November 4, 1895.

To the Honorable the State Board of Horticulture:

Gentlemen: During the past six months there arrived in the port of San Francisco fifty-three steamships and sailing vessels that had trees and plants on board. The receipts consisted of 437 cases and crates of trees and plants, and 387 lots in small boxes, baskets, and loose. Out of these, 2,674 fruit trees and ornamental plants were rejected and destroyed, as they were infested with insects new to the State. The insects found were principally scales, and some borers. Of the scales, the following list will be of interest:

In 1891 I reported the existence of the "Florida or Cuba red scale" (*Aspidiotus ficus*, Ashmead) on *Ilex latifolia*, from Japan. Only a few scattering scales were then found, but this season a shipment of *Aspi-*

distria lurida, from Osaka, Japan, was very seriously infested with this destructive orange scale. Pomelo oranges from China were slightly specked with this pest, showing the existence of it in that country.

The true "red scale" of the orange (*Aspidiotus aurantii*, Maskell), I found upon cocoanut palms from Central America. They were not very numerous, which would indicate its recent introduction there, or the existence of a parasite that holds it in check, for this is the first time that I have found this scale coming from Central America.

From Acapulco came five ornamental plants like Anthuriums, that were infested with scales belonging to the family of which the "purple," the "long," and the "oyster-shell" species have made this group very much to be feared by fruit-growers in the countries where they are found. This one was new to science, and named *Mytilaspis carinata* by the well-known coccid authority, Prof. Theo. D. A. Cockerell. Another new species of this family is *Mytilaspis crawii*, Cockerell. This is a very difficult one to detect, due to its mining habit, smallness, and color. It was found on *Quercus cuspidatus*, and a species of eleagnus from Japan. From the last named country came plum, walnut, and cherry trees infested with the very destructive white scale (*Diaspis amygdali*, Tryon). This species slightly infests the stems and roots under the surface of the soil, like *Aulacaspis rosæ*. Another white scale from Japan was *Chionaspis difficilis*, Cockerell, covering the stems and branches of the fruiting eleagnus. *Chionaspis euonymi*, Comstock, came on euonymus from Japan. Prof. L. O. Howard reported this species as attacking citrus trees in Louisiana. Prof. Comstock reported it on the Japanese *Euonymus latifolius* at Norfolk, Va. The new *Lecanium* (*L. longulum*, Douglass), referred to in my last report, I found upon three other kinds of plants from Honolulu, viz.: ferns, crotons, and casuarinas. The "red wax scale" (*Ceroplastis rubens*, Maskell) was found on orange trees, alligator-pear trees, and ferns from Honolulu. Our common "black scale" would have to be re-christened should *Lecanium nigrum* of the Sandwich Islands get a foothold here. This scale is smooth and of a shiny black color in the adult stage, and from the condition of the infested plants that I destroyed I think it would hold its own against *Lecanium oleæ* as a breeder. A new "mealy bug" (*Dactylopius pandani*, Cockerell) came on screw pines (*Pandanus*) from Marquesas Islands.

The "long scale" (*Mytilaspis gloverii*, Packard) infested crotons from Honolulu, and palms and lime trees from San José del Cabo, Mexico; and the "purple scale" (*Mytilaspis citricola*, Packard) was on lime trees from Guatemala. On the usually clean camphor trees from Japan I found *Aspidiotus duplex*, Cockerell. This scale also infests camellias, orange, azaleas, Olea fragrans, and Myrica rubra.

While heretofore the Japanese have confined their trade to furnishing the United States and Europe with ornamental stock and bulbs peculiar to their country, they now propose extending their trade by cutting into our home nurseries, and offering fruit trees of American and European varieties at prices that would mean bankruptcy to our nurserymen. One hundred samples of one-year-old apple trees, five to six feet high, from the graft, came forward this season, but were burned, as they were infested with scale insects. Fruit trees and general nursery stock are admitted free of duty, and plants used for forcing under glass for cut flowers or decorative purposes are charged a duty of 10% ad valorem.

On Sunday, April 19th, the steamship "Gaelic" arrived from Hongkong. A passenger en route to Ireland brought a male and female mongoose from India. Experience in the Sandwich Islands and in Jamaica has shown the disastrous results of importing the mongoose in the hope of destroying rats and other ground pests. Under your Rule XII, "animals detrimental to fruit or fruit trees, plants, etc.," are prohibited from landing, so they were detained on board. I telegraphed to the Department of Agriculture at Washington, D. C., notice of their arrival, and received a telegram in reply from Assistant Secretary Chas. W. Dabney, to the effect that the Department knew no law to prevent their introduction, but that every effort should be made to discourage their being landed. The owner expressed his intention of visiting the southern portion of the State and taking the animals with him; this brought them under your regulations. The danger of the female escaping, through an accident or carelessness, was too great, so they were held, and before the ship sailed (April 25th) the surgeon of the "Gaelic" killed them with chloroform. Under date of April 21, 1896, Assistant Secretary Dabney wrote: "If the mongoose once gains a foothold in California it will probably increase rapidly, and the damage resulting from the destruction of small mammals and insectivorous birds, and the consequent increase of insect pests, will be incalculable."

There is no national law or regulation to prevent the introduction into the United States of even such a terrible pest as the Australian rabbit, and as there are other ports of entry, outside of the State of California, where they can be landed, I consider it would be a wise procedure for Congress to enact a stringent law leaving no loop-hole for thoughtless or careless people to bring such pests. I have suggested this matter to the Department of Agriculture.

Having no funds at your disposal, I have been without assistance for the past nine months, so my time has been taken up entirely with quarantine duties and correspondence.

I have to acknowledge receipt of four boxes of ladybirds, on December 13, 1895, from Hong Kong, China, kindly forwarded by Mr. Albert Koebele. They are all aphis-eaters, and were in very good order. One species (*Synonycha grandis*) measures nearly half an inch across. Over sixty were liberated in an apple orchard in Alameda County. The other three species were turned loose in the same orchard. Corn-husks (inverted) were tied upon the branches as a protection and for them to hibernate under.

Respectfully submitted.

ALEXANDER CRAW,
Quarantine Officer.

San Francisco, May 1, 1896.

XVI.

REPORTS OF COUNTY HORTICULTURAL COMMISSIONERS

The following letter was mailed to all Secretaries of County Boards throughout the State:

Office of State Board of Horticulture,
Sacramento, Cal., August 14, 1896.

To County Horticultural Commissioners:

Gentlemen: Sections 4 and 17 of the laws of 1889 (Stats. of Cal., pp. 89 and 413) provide: "It shall be the duty of said County Boards of Horticultural Commissioners to keep a record of their official doings, and *to make a report* to the State Board of Horticulture, on or before the 1st day of October of each year, *of the condition* of the fruit interests in their several districts, what is being done to eradicate insect pests, also as to disinfecting and as to quarantine against insect pests and diseases, and as to carrying out of all laws relative to the greatest good of the fruit interests. Said Board shall publish said reports in bulletin form, or *may* incorporate so much of the same in their annual report as may be of general interest."

We beg to request that all County Boards (except where there is but one Commissioner) meet and consider their reports to be made to the State Board, and not send same, as has been done, in the form of an individual letter without the approval of the other members.

We also beg to request that the reports be filed, if possible, by September 15th, in order to prepare same and embody in our report.

Respectfully,

ELLWOOD COOPER,
President.

B. M. LELONG,
Secretary.

The following reports reached us in time, and are the only ones received:

FRESNO COUNTY.

To the Honorable State Board of Horticulture:

Gentlemen: We, the Horticultural Commissioners of Fresno County, beg leave to submit the following annual report:

The total number of orchards inspected in the county is 2,035, representing a grand total of 1,575,323 trees, of which 1,483,616 are deciduous fruit trees, 48,267 orange trees, 11,267 lemon trees, and 32,173 olive trees. The respective varieties of deciduous trees represented are as follows: apple, 31,425; pear, 225,791; peach, 789,657; plum, 51,851; fig, 90,574; cherry, 3,462, and almonds, 20,979.

The number of orchards found to be infested with pernicious scale is 988, leaving 1,047 orchards now apparently clean. The total number of deciduous fruit trees imported into the county during the season is 341,099; of orange trees, 65,360; lemon, 725; grape-fruit, 270; olive, 5,945; chestnut, 3,000; all of which were duly inspected upon arrival. The total number of deciduous fruit trees exported from Fresno County during the season is 158,467, and of orange, 2,261; lemon, 234; olive, 7,856; also, 50,000 grapevines and 390,000 grape-cuttings. In all cases where scale was found to exist upon trees inspected, the owners or persons in charge or possession thereof were duly notified to eradicate the same, and in every case where refusal or neglect of that duty occurred, the Commissioners in charge of such districts proceeded according to law, and enforced the spraying of said trees.

In all, 45 orchards were sprayed by the county spraying outfit, the expense of which, upon all orchards where owners did not pay at the time of spraying, became a lien upon the property. In nearly all of the other infested orchards the work of spraying was cheerfully performed by the owners, and their hearty coöperation with the Horticultural Commissioners will do much to lessen the ravages of many damaging insect pests.

The codlin moth has damaged the fruit interests in Fresno County to a very great extent for many years—so much so that a majority of the growers of apples and pears had about despaired of ever succeeding in making anything out of their orchards, which have cost them such large sums of money and so many years of hard labor; but the present year the Horticultural Commissioners succeeded in having a large number of apple and pear orchards sprayed with Paris green, and are now in a fair way to bring into profitable production all of the apple and pear orchards of the county. It is estimated that the saving to the owners of the pear and apple orchards in this county this year (the first time that anything like general work has ever been attempted) will range from $25,000 to $50,000, which should and will be greatly increased in years to come.

The red spider has spread to an alarming extent, and has this year been the cause of great damage to the fruit trees, and to fruit of nearly every description, the trees in many prune and other orchards being entirely denuded of their foliage, leaving the exposed fruit to dry and wither on the trees. A thorough battle of extermination will be waged at the proper time by the Commissioners.

Great fear is still entertained by the people here that through carelessness or neglect on the part of quarantine guardians, the fatal disease of "yellows" may yet be introduced into California. Too strict measures could not be enforced for our protection in this particular instance.

We are to some extent troubled with cottony-cushion scale, woolly and plum aphis, but they are as yet considered minor difficulties. Root knot upon nearly all deciduous fruit trees is becoming more and more prevalent, and is a formidable obstacle in the way of propagating trees in the nursery; so far we can only destroy them, as we have already done by the thousands, when found. When the secret of this trouble is discovered, and a remedy or preventive found, it will be a boon to California. Altogether, the condition of the fruit interests of Fresno County is very prosperous, and the matter of successfully growing citrus fruits here is fully established. The owners of bearing orange orchards are already shipping many carloads of that fruit annually. The entire shipments of raisins, green and dried fruits, etc., during the year ending September 1, 1896, from the seven points, Fresno, Malaga, Fowler, Selma, Kingsburg, Sanger, and Reedley, are as follows: Raisins, 2,725 carloads; dried fruit, 350 carloads; green fruit, 436 carloads; oranges (from the town of Sanger), 27 carloads, or equal in all to a railroad freight train 30 miles in length.

All of which is respectfully submitted.

J. R. BAIRD, President,
J. A. ROSE, Secretary,
J. F. McDONALD,
County Horticultural Commissioners.

FRESNO, September 1, 1896.

LOS ANGELES COUNTY.

To the Honorable State Board of Horticulture:

GENTLEMEN: I have the pleasure to submit the following report:

The past season has, on the whole, been very unfavorable to the fruit-growers in Los Angeles County, the extremely cold weather last winter having done great damage to the orange and lemon crops. In some low-lying localities trees were frozen and much fruit spoiled. The most serious damage, however, was done to the coming crop. The trees, both orange and lemon, bloomed profusely, and a great crop was anticipated, but two thirds or more of the young fruit dropped, resulting in leaving little more than half a normal crop for the coming season. Deciduous trees also suffered severely. Many peach and prune orchards did not leaf out until June, and then only partially, and the crop was very light. Apricots also were below the average, and olives will be almost a total failure.

There was a shortage of rainfall last winter, which also contributed to the general failure of the crops. Many districts are now suffering for want of irrigation water, and should we have early rains, accompanied by warm weather, the trees will bloom prematurely, and thus materially injure the crop of next year.

The light rains interfered with planting, and much land was not set out to trees that otherwise would have been. Nurserymen grubbed up and burned thousands of trees; to such an extent, in fact, that at the latter end of the season orange stock became very scarce and high priced. The supply of good Washington Navel stock will be short this coming season.

The fungus that I mentioned in my report of last year, and that promised early in this season to do great damage to the walnut trees here, was materially checked by the dry, warm weather in the spring, but will no doubt again make its appearance when the weather conditions are favorable.

Scale pests have not been so destructive to orchards as in former years. The pernicious scale has in many localities entirely disappeared. The red scale is still decreasing, and is now, with a few exceptions, confined to old seedling orchards south of Los Angeles City. The extreme heat has destroyed at least 90% of the black scale.

The *Orcus chalybeus* has entirely disappeared. Not a single specimen is to be found.

The *Rhizobius ventralis* has now got a foothold in a number of orchards between the City of Los Angeles and the coast, and has done good work, but along the foothills and in the interior it is still a failure. I am distributing colonies (of about one hundred) daily, free of charge.

The price of cyanide of potassium having dropped almost one half, fumigation is becoming general in localities where the black scale is still troublesome.

We have made many attempts during the past season to eradicate scale by steaming the trees, but so far have met with little success. The results are much more uncertain, the danger of injuring the trees greater, and the expense as great as the cyanide process.

Respectfully submitted.

JOHN SCOTT.

LOS ANGELES, September 24, 1896.

MERCED COUNTY.

To the Honorable State Board of Horticulture:

GENTLEMEN: In complying with the law in regard to the horticultural interests of Merced County, I will state that there is a decided improvement in the condition of the orchards of this county. I find that the scale is not nearly so plentiful as it was a year ago. I also find almost every one owning an orchard ready to comply with the law. With the remedies at hand, there is no trouble to get rid of all the fruit pests with a little work. In most of our young orchards the trees are raised in this county, and do better than trees brought in from other districts. Our trees here are looking better than they have for four or five years; less spider and yellow mite than for years; fruits of all kinds are better and cleaner this season, showing that care is everything when it comes to raising good fruit in California. There have been a great many trees planted in this county the past season, mostly peaches, as Merced is becoming one of the great peach counties in California. The prospects are bright for planting a great many young orchards another year.

Respectfully submitted.

H. A. W. TORCHIANA,
President.
N. H. WILSON,
Secretary.

MERCED, September 12, 1896.

ORANGE COUNTY.

To the Honorable State Board of Horticulture:

GENTLEMEN: It is plain to us that horticulture in Orange County is yet in its infancy. The conditions of success are but imperfectly known. Up to this time, citrus culture has been the chief industry. From six to eight hundred carloads have been annually shipped away, and, since the organization of the exchange system, the returns have been moderately fair. Many changes have taken place in our groves; some of the early plantings have been removed, and better varieties have been planted in their place; others have been cut back and budded to choicer kinds.

Pests.—These may be classed as two kinds: plant diseases and scale bugs. Of the former, we have several varieties, concerning the remedies for which, we as yet know but little. Of the latter, we have the red, white, black, and purple scale, all of which are very pernicious. Besides these, we have many other varieties, less destructive, because subject to native parasites.

Beneficial Insects.—It has been and still is the care of this Board to use and encourage the use of beneficial parasites to the utmost, believing there may yet be found an enemy to each and every variety of scale pest. The white cottony-cushion scale is held in perpetual check by the *Vedalia cardinalis*, care being taken on our part to keep enough of them on hand to supply new developments of the scale.

On the red scale (*Aspidiotus aurantii*) we have several varieties of native ladybirds and parasites working, but all of these combined do not avoid the necessity of spraying or fumigating at least once a year. This is a very heavy tax on the industry.

For the black scale, we have been supplied quite liberally by the State Board of Horticulture with the *Rhizobius ventralis.* The success of this has been but partial.

The purple scale (*Mytilaspis citricola*) is a new pest in this county, brought from Florida on nursery stock. For this we have found no remedy but *fire.*

The insecticides for the red and black scales are:

First—Fumigation by hydrocyanic acid gas for large trees;

Second—Resin wash for small trees.

Formula for fumigation: 6 ounces of 98% cyanide of potassium, 6 ounces of sulphuric acid, 12 ounces of water, for each 1,000 cubic feet of tree. Time to each tree, 40 minutes. The night is used to avoid light, heat, and seabreeze.

Formula for resin wash: 15 pounds of resin, 5 pounds of caustic soda, 3 pints of fish oil, boiled three or more hours in 100 gallons of water.

Application of fumigation, once a year, and of the resin wash, twice a year.

Our deciduous fruit industry consists of all the varieties raised in temperate and semi-tropic countries, and walnuts in addition. Walnut-growing promises soon to be the leading industry.

The county is divided into three horticultural districts, each of which is under the charge of one Commissioner, who is his own Inspector.

Quarantine.—During the season of planting, a close quarantine of all imported nursery stock is maintained. A local ordinance by the Board of Supervisors makes it a misdemeanor for any one to bring into the county, nursery stock without reporting the same immediately to the Commissioner of the district.

A few years ago a "mysterious disease" appeared in our vineyards that destroyed every vine. Since that time the grounds have been replanted, but the presence of the old disease is apparent.

A bacterial disease has appeared in a few places on growing walnuts, but no serious damage has yet been done. Measures are being taken to remedy it.

I. N. RAFFERTY,
HIRAM HAMILTON,
L. G. HUNTINGTON,
Commissioners.

SANTA ANA, 1896.

PLACER COUNTY.

To the Honorable State Board of Horticulture:

GENTLEMEN: In accordance with the law, we beg leave to report as follows:

We have, during the past season, discharged our duties as County Horticultural Commissioners in as full a manner as possible. The fruit trees were sprayed in the winter for scale, with lime, sulphur, and salt, and later with Paris green, for codlin moth. We also instituted a strict quarantine for the prevention of introducing trees diseased in any manner, or of shipping any without inspection.

Unfortunately, our fruit crop has proved an entire failure in the portion of the county north of Auburn, and the crop in other portions has been very inferior. The grapes escaped injury.

Mr. Baker, of our Board, has found phylloxera to a slight extent in a vineyard near Colfax.

Respectfully submitted.

W. M. BAKER,
Chairman.
GEO. W. APPLEGATE,
Secretary.

AUBURN, September 18, 1896.

RIVERSIDE COUNTY.

To the Honorable State Board of Horticulture:

GENTLEMEN: In transmitting our annual report for the present year, we have thought best to briefly mention the fruit-growing districts of the county, in order that you may have an adequate idea of our horticultural resources.

The extreme western one fifth of this county is about all of it that is productive, the balance being desert and mountains. In this area of about 1,200 square miles is found all of the agricultural and horticultural, and much of the mineral, wealth of the county.

In the northern part of the county, along the line of the Southern Pacific Railroad, are the towns of Banning, Beaumont, and El Casco. At Banning there is a prosperous colony, possessed of splendid land and abundant water-supply. Here all kinds of deciduous fruits flourish, the colony being especially famous for its prunes, apricots, and almonds. About two thousand acres are devoted to these fruits. A large amount of new land is being planted, and the colony is growing every year.

At Beaumont there are several hundred acres devoted to horticulture; apples, cherries, and peaches being their principal products, but almonds and apricots being also largely produced. Beaumont is not so fortunate as Banning as regards a water-supply, but, having a heavier rainfall, less irrigation is required.

At El Casco the principal industry is dairying, but horticulture receives considerable attention, and much fine fruit is produced.

A few years ago the Moreno and Alessandro Valley had as bright prospects, from a horticultural standpoint, as any locality in the State. With a fertile soil, an industrious and thrifty people, and what was thought to be an abundant and cheap water-supply, the horticultural future of this valley seemed assured. But at present, owing to complications with the water company and the uncertainty attending the outcome of the litigation over the Wright irrigation law, the work of development, so auspiciously begun some years ago, has been practically suspended, and no new movement seems possible under present conditions. However, with a settlement of their present difficulties, a resumption of their old-time progress could be confidently expected to soon place this valley in the front rank of the fruit-growing districts of our county.

Perris, being subject to practically the same vicissitudes as Moreno, is in much the same condition. In neither of these settlements has there been any considerable new planting the past season, the high price of water and difficulty of obtaining it serving to discourage enterprise in that direction.

In the colony of Lakeview some tree-planting has been carried on and several quite important orchards have been set, but, owing to trouble in regard to the water-supply, development has been limited, and at present is practically at a standstill.

San Jacinto, Hemet, and Florida comprise what is at present the principal deciduous fruit producing district in the county. Situated near the San Jacinto Mountains, liberally watered, much of the land being moist and not requiring irrigation, this part of the county is particularly favored in the matter of being adapted to horticulture. The Lake Hemet Water Company supply the Hemet lands with abundant and cheap irrigation. Much of the San Jacinto land is moist, and what is not is supplied with fine water-rights. At Florida the situation is much the same as at San Jacinto. In this part of the county many new orchards are being put out, and development of the industry is quite rapid.

The Winchester and Diamond Valley country, while being principally an agricultural section, has many fine orchards, and the production of fruit is quite heavy. The water-supply, while not sufficient for all the lands, is adequate for all the orchards now growing, and thrifty and well-kept trees is the invariable rule with the orchardists in this part of the county.

In what is known as the Murrietta Valley, the towns of Wildomar, Murrietta, and Temecula are situated. In this, the southern part of the county, horticulture has not been developed to the extent it has in other parts of the county, but enough has been done to demonstrate the fact that it is well adapted to fruit-growing. Considerable land in this part of the county is moist; in fact, very little irrigating of orchards is done, most of them being on moist land.

At Elsinore and the settlements around the lake of that name, there is quite a body of fine orchards, and a large amount of fruit is shipped from this point every season. Most of the orchards here are on moist land, as the water-supply for irrigation is not very great. About one thousand acres is devoted to horticulture at this point, and, were a reliable water-supply for irrigation provided, this acreage could be easily doubled.

We have briefly mentioned the districts where deciduous fruits are the principal horticultural industry. It is true, quite an acreage has been set to oranges in the Moreno and Alessandro Valley, and a few acres are planted at Perris and Elsinore, and about 150 acres at Florida, making in all about 1,000 acres, outside of the Riverside Valley and Corona. We will now briefly refer to our citrus-growing districts.

Corona (South Riverside), the noted frostless belt, has been extending her acreage so rapidly that she will soon become a close competitor, as an orange-growing district, of the far-famed Riverside. She now leads all other sections in acreage planted to lemons, and with her ample water-supply, which is under complete control of the consumers, in addition to her superb location and her immunity from frost, she has other resources at hand to make her, not only a great fruit-growing center, but an important manufacturing center as well.

We have reserved the Riverside Valley for the last, in order to show the extensive horticultural development of our county outside of its greatest and best fruit-growing district. We will not attempt to add anything to the glory and fame of Riverside as an orange-producing center, or as a land of beauty and progress. This has been done by more eloquent pens than ours, but we would say that, in spite of the destructive frost of last winter, the severest ever known to visit us, the acreage set to citrus fruits in this valley has increased by about 300 acres the past season. The total shipment of oranges for the season amounted to 555,310 boxes, making 2,021 carloads. The crop for the coming season bids fair to come up to the average, despite the heavy falling of the young fruit and the loss from trees injured by last winter's frost.

The work of the Commission has been kept up by the present members to the high standard of efficiency established by our predecessors, and we feel confident that in no county in the State are more thorough quarantine and inspection regulations enforced, or injurious insects more promptly destroyed. The black scale, which has been troubling us considerably the past few years, has largely decreased, and at present, by many of our orchardists, is not considered a factor in their horticultural operations. However, we shall be prepared to combat this pest should it become damaging again. The fight against all other insect pests is being waged with the same thoroughness that has characterized our operations in the past, and is marked with a greater degree of success than ever.

It is noted that there is an apparent increase in the amount of gum disease observable in our groves, and we are devoting considerable attention to this matter, and hope to get the Department of Agriculture to detail an expert to study these matters, with a view to determining the nature of and treatment for these diseases.

GEORGE VAN KIRK,
FELIX G. HAVENS,
Commissioners.

RIVERSIDE, September 14, 1896.

SACRAMENTO COUNTY.

To the Honorable State Board of Horticulture:

GENTLEMEN: I herewith submit my report as Horticultural Commissioner of Sacramento County:

I have inspected every orchard in the county, and find most all of them more or less infested with pernicious scale. With but a few exceptions, every orchard in the county has been sprayed with lime, sulphur, and salt this year; the scale is very much on the decrease, and I think it will be but a little while, with proper treatment, before it will be entirely eradicated. I found some orange orchards infested with soft brown scale, and had them treated with whale-oil soap solution; also, some with yellow scale, which I had sprayed with resin wash.

I find pear aphis in some parts of the county, which proves to be a very serious pest, and very difficult to fight. L. D. Greene, of Walnut Grove, treated some trees on his place with common salt in 1895, and the trees so treated made a good growth, but it did not kill all the aphis. Mr. Greene applied the salt by first digging a ditch around the base of the tree, and used about four pounds of salt to each tree, and plenty of water. Codlin moth has not been so bad this year as in former years. Almost every orchard was sprayed with Paris green solution as a preventive against it.

I have distributed a number of *Vedalia cardinalis* where I found some orange and lemon trees infested with cottony-cushion scale, and they are doing good work.

On some shipments of deciduous trees into the county I found root knot; all trees thus affected were destroyed. On one small shipment of orange and lemon trees from Los Angeles County, were some live black scale; they were held and disinfected.

There were about 50,000 citrus and 70,000 deciduous trees planted in this county this season.

Respectfully submitted.

JOHN N. STEPHENSON,
Commissioner.

SACRAMENTO, September 16, 1896.

SAN BERNARDINO COUNTY.

To the Honorable State Board of Horticulture:

GENTLEMEN: In December, 1895, our Honorable Board of Supervisors, in the interests of economy and a desire expressed by the press and the late Grand Jury of our county, decided to reduce the Board of Horticultural Commissioners from three members to one, and in January, 1896, appointed S. A. Pease as sole Commissioner in and for San Bernardino County.

But the former Board of Horticultural Commissioners were advised by their attorneys that the action reducing the Commissioners was illegal, causing considerable inconvenience and annoyance to nurserymen and horticulturists. After an agitation of the subject for several months the matter was finally brought before the Superior Court, and in May, 1896, Judge George E. Otis decided that the law giving the Supervisors power to appoint a Commission of one man was unconstitutional, and if constitutional, only applied to counties where no Commission existed.

Therefore, nothing remained except for the Board of Commissioners to be increased to three members again. The present Board, as now constituted, consists of S. A. Pease, Chairman, W. J. Melville, Secretary, and H. B. Muscott.

In June we found the black scale (*Lecanium oleæ*) in several parts of our county, causing considerable trouble; in the west end, mostly on olives, oranges, and lemons; in the east end, on apricot and ornamental stock. After a careful examination of the situation it was decided to give the *Rhizobius ventralis* a fair and impartial trial. To that end ten orchards were selected where the conditions seemed most favorable, and food plentiful—in Ontario, Cucamonga, Colton, Highlands, Messina, and Idlewild—our Board of Supervisors granting us power to make a contract whereby we could obtain 10,000 *Rhizobius* per month; and these were placed on the same trees in the orchards every two weeks in colonies of 500. Thus far those placed in Ontario and Cucamonga have given the best results, as there is more humidity in those localities than in the foothills of Highlands. But we shall have to wait a few months yet to determine the benefits derived from this little parasite.

We examined the orchards in July and August and found from 60% to 70% of the *Lecanium oleæ* to be dead, killed by the excessive heat, and the eggs dried up. The scale seemed to hatch out earlier this year than usual. We found the young live scale on the trees in the early part of July, but in August the young scale in many orchards were dead. The white scale (*Icerya purchasi*), which obtained such a foothold in the eastern part of our county over a year ago, has been almost exterminated by the *Vedalia cardinalis*, which in every instance has proved successful. At first the orchardists were alarmed, and in a few instances sprayed their trees, but after seeing what the little parasite could do they determined to allow it to clean their orchards of the pest.

Only a few cases of red scale (*Aspidiotus aurantii*) have been found in our county, and radical means were adopted to eradicate the same, viz., fumigation, which in every case has proved successful, and at the present writing we do not believe a single red scale exists in our county. In one case it was brought in on young trees from an adjoining county, and they were planted before our inspector had knowledge of it, showing how necessary it is for inspectors to be on the watch.

The San José scale (*Aspidiotus perniciosus*), which for the last four years has ceased to trouble us, owing to the thorough spraying with that never-failing wash, lime, sulphur, and salt solution, bids fair to return to a limited extent. But with the winter coming on, spraying will again be resorted to, as our orchardists have found their fruit clean and bright and commanding better prices than when their orchards were infested.

The red spider (*Tetranychus telarius*) we find prevalent upon almond, pear, prune, and plum trees, but not to any alarming extent.

We find root knot on almost every kind of deciduous stock, more particularly upon peach and apple roots. A great many theories have been advanced as to the cause of this disease, but so far we are no nearer the solution of the difficulty.

One of the greatest sources of danger to our county is the importance of ornamental stock from infested districts, and in the early part of this year plants have been quarantined and disinfected which otherwise would have infested the whole district. We have found *Aspidiotus nerii*, *Chionaspis aspidistræ*, *Aspidiotus camelliæ*, *Aspidiotus ficus*, *Diaspis boisduvalii*, *Aspidiotus aurantii*, *Lecanium oleæ*, *L. hesperidum*, *A. juglans-regia*, *Diaspis rosæ*, and *A. citrinus* on ornamental stock, Anguillula root-knot on persimmon, and woolly aphis (*Schizoneura lanigera*) on apple trees, thus showing the necessity of strict quarantine laws and systematic inspection. We believe a change in our postal laws would be a great help to the Commissioners of the State, so that postmasters could inform the inspectors or quarantine guardians when buds, plants, or other stock sent by mail from outside of our State (and very often from infested districts) are shipped in, or even from within our own State. We have found buds sent from Florida with purple scale (*Mytilaspis citricola*), long scale (*Mytilaspis gloverii*), and chaff scale (*Parlatoria pergandii*), and if permitted to be taken into the orchards would in all probability have infested them.

The planting of citrus and deciduous stock has been much larger this year than last, the citrus planting being stimulated by the frost in Florida two years ago. Many thousands of orange trees have been sent to the northern part of our State, Arizona, and Florida. Our trees are in a healthy condition and doing well. Our crop of citrus fruits will be a little short, below the average, but with young orchards coming into bearing we can look forward to a very large increase next year. Peaches and apricots are also very light, and prices in most cases ruling low.

We have a corps of twelve inspectors, and our Board of Commissioners feels greatly encouraged with the result of its efforts to rid the orchards of the different pests. Knowing the importance of the fruit interests, which will yearly require more care and supervision, together with a judicious expenditure of the county funds, and having the hearty coöperation of the horticulturists, and the generous support of our Honorable Board of Supervisors, we feel sure our county can be kept in a healthy condition.

The above report was adopted at the regular meeting of the Board of Horticultural Commissioners, September 5, 1896.

Respectfully submitted.

W. J. MELVILLE,
Secretary.

SAN DIEGO COUNTY.

To the Honorable State Board of Horticulture:

GENTLEMEN: I have the honor to submit herewith the annual report of the Board of Horticultural Commissioners of San Diego County.

The county is divided into three horticultural districts: W. R. Gunnis, of San Diego, Chairman, for the First District; Chester Gunn, of Julian, for the Second, and F. Austin, of Escondido, Secretary, for the Third. We meet once in three months for the purpose of comparing our work, exchanging ideas, and for general discussion of our duties. The Commissioners have been active, and are pleased to state that the orchardists have complied with the law very generally. We have had no trouble to get them to treat their infested trees, and can say that beneficial results have followed. We have various scale pests to contend with, and find they yield readily to kerosene emulsion, providing it is applied at the right time, leaving no bad results on the fruit or trees. Large trees are generally fumigated with hydrocyanic gas. The scale is gradually disappearing, owing, we believe, to the extreme warm summer. We find comparatively few apples infested with codlin moth.

The *Rhizobius*, as a parasite for black scale, has not proved altogether successful in this county. We have placed a few colonies this season in such orchards as we think suitable for their colonization, hoping they may become colonized and prove beneficial. We have many varieties of ladybirds in this county that feed on young scale, but their process is too slow as scale-destroyers. The most beneficial insect at present is the little chalcid fly, and we find evidence of its work in all parts of the county. In some cases 90% of the black scale have been destroyed by our little friend (*Delophogaster Californica*). We find that trees that have been pruned properly are less infested with scale than those that are allowed to go as nature directs them. Training them up, thinning out, thus better providing them with sunshine and air, is as beneficial as spraying. Our orchards that have the benefit of irrigation are all doing well, and are looking better than ever before. Growers work intelligently, trying to eradicate the scale pests, and success is being met with by those using kerosene emulsion. The die-back, or *Exanthema*, has found its way to this county. In some cases the disease is well developed on both Florida- and California-grown trees. Our treatment has been to cut off all infested parts. Others have taken out their infested trees. The disease appears generally under similar conditions of soil and poor drainage.

The oranges and lemons dropped their fruit during the early summer to such an extent that the crop promises to be less than last year. Our deciduous trees are yielding very light crops, owing to the condition of the spring season. Our trees started off in fine shape much earlier than usual; later the weather became cold and remained so for seventy days, thereby prolonging the blossoming season through a period of three months. Many of the prune trees were in full bloom the last of June, and at that time the hot weather destroyed the blossoms, and the result is, apples and pears will yield about 40% of a crop, apricots about 50%, prunes, peaches, and plums, 10%; except Japanese varieties of the plum, which blossomed before the cold weather struck us and matured nicely, with a fair yield. Our mountain districts are mostly devoted to apple culture, and the apples grown there are second to none, and the industry is gradually growing and is thought to be very profitable. Nearly all deciduous fruit trees thrive and produce the highest grade of fruit. In the mountain districts the red spider has been quite prevalent this season. It appears to yield to a treatment of sulphur, which may be blown or sifted on young trees, and can be applied to large trees by means of a seed-sower.* Spraying with cold water under high pressure will destroy them. The nursery trees came into this county generally in good condition. Out of more than 100,000 nursery trees, one consignment of lemon trees was found infested with *Mytilaspis citricola*, and they were condemned and burned. One consignment of orange trees was found to be infested with *Lecanium oleæ;* these were dipped in kerosene emulsion.

Mr. W. R. Gunnis estimates that the lemon plant in his district the past two years has been 25% of an increase, or 108,000 trees, and 6,150 orange trees, with an increase of about 10% in olives and deciduous trees.

The following table gives the tree plant in the Third District for the year 1896:

Oranges	5,296
Lemons	20,200
Olives	30,893
Deciduous	52,597
Total	108,986

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* Shown for the first time in Report of State Board of Horticulture, 1893–94.

The following table gives the trees and vines that have been inspected in the county. A large per cent of the trees in the Third District have not been inspected. This table does not include the plant of 1896:

Variety.	Number.	In Bearing.
Oranges	210,441	40%
Lemons	553,131	20
Apples	113,407	50
Apricots	80,913	70
Cherries	4,284	30
Figs	34,225	85
Nuts	51,493	20
Olives	154,885	16
Pears	40,992	50
Peaches	197,526	60
Prunes	150,817	40
Miscellaneous	4,342	60
Vines	2,019,877	96
Nursery stock	287,000	--
Seed-bed	2,225	--

The exportation of oranges and lemons the past year is as follows:

Oranges	40,330 boxes
Lemons	53,830 boxes

Respectfully submitted.

F. AUSTIN,
Secretary.

ESCONDIDO, September 20, 1896.

SAN JOAQUIN COUNTY.

To the Honorable State Board of Horticulture:

GENTLEMEN: Herewith find my report as the Horticultural Commissioner for San Joaquin County.

San Joaquin County, situated as it is with its water and rail facilities and its great fertility of soil, is rapidly coming to the front as a fruit-producing county. Farmers who have been raising wheat at a price below the cost of production are beginning to see the advantages gained by having orchards and vineyards when their grain crops are not satisfactory. In 1895 the grain crop was short and prices low, while all the orchards and vineyards had good crops, which sold readily at good prices. This condition of affairs opened the eyes of the farmer, and now we find young orchards and vineyards where formerly grain was growing. Over 600 acres were planted during the winter of 1895–96, and a still greater acreage is to be planted during the coming season.

Of all trees in this county the almond heads the list with 1,431 acres. The largest almond orchard in the county is that of P. B. Armstrong, of Acampo, who owns 480 acres in one body, which is said to be the largest almond orchard in the world. This year, with only half a crop, he will get 200 tons of choice almonds, which will no doubt sell for 12 cents a pound, bringing in a revenue of $100 per acre. This shows that an almond orchard in this county is a most valuable investment, as the crop has never failed except in case of a frost, such as occurred this year, something which happens only once in about thirteen years.

The almond crop is now being harvested and gives employment to many people, there being fully four hundred people employed in the Langford colony alone. Women and children are mainly employed in curing the nuts, and they make from 85 cents to $1 50 per day, according to their ability.

Plums and prunes in great variety are grown in this county, fully 1,185 acres being planted with them. The varieties embrace all the leading kinds, including the Burbank, Somoni, Splendor, Abundance, and Tragedy, most of which are of Japanese origin, and are noted for their elegance and good shipping qualities. The bulk of the plum and prune crop is shipped East in a green state. Prices having been unusually good this season in all the Eastern markets, the growers find it pays them better to make this disposition of their prunes than to dry them.

Our soil is peculiarly adapted to plums and prunes, and I look for a large increase in the plum and prune industry in the near future.

Peaches rank next on the list, there being 959 acres devoted to the cultivation of this fruit alone, the largest holding being that of Senator B. F. Langford, who has 400 acres in one tract. Fully 75% of the peach crop is either shipped green to the Eastern markets, or is dried. The balance is sold locally and to the canneries in San Francisco. Prices this year ranged from $12 50 to $20 50 a ton for freestones, and from $17 50 to $27 50 for clings, there being an unusual demand for choice clings of all varieties not red at the pit. The peach has proved one of the most profitable fruits grown in this county. It bears at an early age, and a failure of the crop is unknown.

Apricots, too, are extensively raised here, fully 870 acres being in this fruit. The tree, as a rule, is remarkably thrifty and long lived, and is usually a very heavy bearer. All the leading varieties are grown here, such as the Blenheim, Moorpark, Royal Peach, and the New French, which was propagated by a local nurseryman. Fully 90% of the fruit is either dried or sold to canneries, the balance going to the Eastern markets.

In pears there are 299 acres planted, the Bartlett being the principal variety. All pears thrive on the heavier soils, and generally bring the grower handsome returns. Very little of this fruit is dried, nearly all being shipped to outside points.

The apple, strange to say, has been sadly neglected, there being only 51 acres of this fruit. It grows remarkably well, but needs constant care to preserve good fruit. A fortune awaits the grower who will plant a good apple orchard, as there is a good local market at all seasons of the year, and Stockton's rail connections with all markets, Eastern and Californian, make apple-raising a safe and sure investment.

Other fruits, such as olives, oranges, figs, cherries, etc., are grown to some extent, and come in for their full share of attention on the part of the orchardists. Grapes are planted more extensively than any other class of fruit, and there are over 2,500 acres in vineyards in the county. Here are raised all varieties of wine and table grapes, and the quality and quantity are all that could be desired. On the heavy, black lands in the vicinity of Stockton are grown the heavy wine grapes, and the justly celebrated Black Prince, or Rose of Peru. This variety, as grown here, has established a reputation for itself all over the Middle-Western and Southern States, and is as famous as the oranges from Riverside. On the lighter soil, such as is found between Stockton and Lodi, the wonderful Tokay flourishes, and has given San Joaquin County a name in all the large cities in the United States. It is shipped exclusively to these larger markets, where it always brings fancy prices. The Muscat of Alexandria, which is grown in other parts of the State as a raisin grape, grows to such perfection that it is raised altogether as a shipping grape here. Its carrying qualities are such that it is greatly sought after, and the demand generally exceeds the supply. The wine vineyards are scattered all over the county, and are not confined to any particular locality. Many of the largest vineyards are in the neighborhood of Lodi and Woodbridge, and on the redlands east of Stockton. The wine industry here has assumed such proportions that San Joaquin County boasts one of the largest wineries and distilleries in the State. Vineyardists, in consequence, find a ready market for all wine grapes here at home at good prices. This winery is owned by George West & Son, and has a world-wide reputation for the wines and brandies made from the products of the vineyards of San Joaquin County.

Following is a statement of the acreage in trees and vines planted in this county:

Variety.	Bearing.	Not Bearing.	Total.
Apples	34	17	51
Apricots	656	214	870
Cherries	71	74	145
Figs	89	20	109
Olives	51	97	148
Peaches	755	204	959
Pears	242	57	299
Plums and prunes	795	390	1,185
Lemons	3	3	6
Oranges	16	25	41
Almonds	848	547	1,431
Walnuts	22	11	33
Small fruits	550	------	550
Wine grapes	394	165	559
Table grapes	749	385	1,134
Raisin grapes	518	198	716
Totals	5,829	2,407	8,236

In addition to the above, I would respectfully state that as far as insect pests are concerned, more attention has been given them than in former years. Our present Board of Supervisors, knowing the acreage of and interest taken in our trees and vines, have deemed it expedient to appoint one Commissioner, whose duty it shall be to devote his whole time, if necessary, to promote and protect the horticultural interests of this county. Our greatest enemy is the codlin moth, which I find very difficult to overcome, notwithstanding nearly every fruit-grower sprays for this one pest. What little black and cottony-cushion scale we have is rapidly disappearing, thanks to the State Board, who have so kindly furnished us with the ladybirds. Our fruit-growers are, as a rule, a very intelligent class, and have coöperated with me to rid the county of what pests we have.

Respectfully submitted.

A. W. YOUNG,
Commissioner.

Stockton, 1896.

SAN MATEO COUNTY.

To the Honorable State Board of Horticulture:

Gentlemen: I herewith submit my report for the past season, or for that portion of it in which I have served as Horticultural Commissioner of San Mateo County.

I received my appointment to this position in February, 1896, prior to which time, for several years, there had been no Board of Horticultural Commissioners. As a result, this was an open county, and became very largely a dumping-ground for refuse nursery stock from all parts of the State. The natural sequence to this state of affairs was that, with the unrestricted introduction of outside pests and the neglected condition of many orchards and grounds within the county, this county was very badly overrun with all the pests common to the State. *Lecanium oleæ* is especially prevalent, and is a serious drawback in our olive orchards. *Lecanium hesperidum* and *Lecanium hemisphæricum* are also prevalent, but not so common as *oleæ*. Of other scale insects, *Mytilaspis pomorum* is common in our apple orchards, while most of the California varieties exist to some extent. The codlin moth is the worst pest with which we are troubled, and there are few apple or pear orchards in the county in which it does not exist.

My chief efforts last spring were directed against the black scale and the codlin moth, as the two worst pests of our orchards. It was late in the season before I could get to work, but I am pleased to report that good results have followed my labors. I succeeded in having many of the orchards sprayed for both pests, and found our fruit-growers and property owners generally willing to second my efforts in this direction; and, while there is still much to be done and more to be wished for, our fruit is much cleaner and freer from pests this year than for many years past.

Many of our orchardists have introduced parasites to combat the pests, and these, as a rule, are doing good work. The *Vedalia*, especially, I have found widely distributed in the county. So much so that I have, wherever I have found the white scale, advised the leaving of it to nature's remedy.

Since my incumbency I have instituted a strict quarantine on all imported nursery stock and plants, and nothing is now allowed to enter the county until inspected, and passed as clean. On this account the late shipments of the season were much cleaner than the earlier ones, and most were accompanied with an inspector's certificate.

With regard to the condition of fruit, it may be reported as spotted. In some sections of the county it has turned out well, in others poorly. Averaging the county, pears and apples have been a fair crop, apricots medium, cherries short, prunes about half a crop, peaches very light, other fruits fair to medium. Taking all classes together, we have had about two thirds of a crop this season.

The area of new fruit planted this year has been small, and but little new land will be put into fruit the coming season. The older orchards, however, will be better cared for, as there is a general disposition on the part of owners to clean up and put their places in shape, provided they are assured that their neighbors will not be allowed to breed pests to their detriment.

Respectfully submitted.

JOHN ISAAC,
Commissioner.

Redwood City, September 17, 1896.

SANTA BARBARA COUNTY.

To the Honorable State Board of Horticulture:

Gentlemen: We have the honor to submit herewith our annual report of the condition of the fruit interests, and what has been done to eradicate insect pests in Santa Barbara County for the year ending September 30, 1896.

Owing to the lack of the usual amount of rain during the last three years, all fruit trees not favored with irrigation have suffered to some extent. In early spring there was a warm spell of about ten days, which started the buds prematurely, and the "cold wave," accompanied in many localities by repeated hard frosts, which followed a few weeks later, destroyed the fruit buds, blossoms, and young fruit to a great degree, so that throughout the county there is, on an average, probably less than half a crop of deciduous fruits, the quality of which is, perhaps, fully equal to that of former years. Some varieties, as apricots, prunes, peaches, and nectarines, have been almost a failure; and while the apple in a few favored places has yielded well and the fruit been of good quality, yet, on an average, it has not produced more than half a crop. The northern portion of the county suffered most from the frosts and severe winds, the grape crop in the Santa Maria Valley being placed at one eighth the usual amount, while in the eastern portion of the county the grape crop is abundant and of excellent quality, and no disease of the vine has been observed. In the same district, Commissioner James Huston reports that a few isolated cases of San José scale yielded to coal oil treatment without injury to the trees; that the fruit industry is in a favorable condition as regards pests; that the *Rhizobii*, colonized there in 1894 and 1895, have mastered the black scale, and the orchards are looking well, especially the olive. The cottony-cushion scale made its appearance, but a colony of *Novius Koebelei* completely exterminated it.

Commissioner C. D. Dorris reports that in the Lompoc district the San José scale has been very destructive in the past, causing the loss of a great many trees; but thanks to our "little Australian friends" (the *Rhizobiids*), that pest seems to be fast disappearing. The "shot-hole fungus" made its appearance again in this district, but with less damage than last year. The "pear-slug" seems to be on the increase there, and measures will be carried out to exterminate it. In general, the orchards in that region are in better condition than for several years.

In the first district the pests have been on the decrease. Strict watch has been kept upon all importations of nursery stock at all the depots, and where necessary disinfection has been required. The condition of deciduous trees shows little appearance of woolly aphis, and a decrease of the codlin moth, compared with past seasons. The olive orchards and orange groves are well nigh freed of black scale, and the same is true of most of the lemon ranches. A few growers have kept up voluntary spraying, but most of them are relying upon the *Rhizobiids* to keep the black scale in subjection. These enemies of the black scale have done their work so thoroughly that, although they are now to be found only in scattered numbers, this fact may be attributed rather to the absence of scale and the consequent scarcity of food than otherwise.

The lemon industry of this district has increased to such proportions that an exchange for curing, shipping, and marketing the fruit has been established this season, with gratifying prospects. Lemon orchards of ten acres from three to five years old are now yielding from two to six tons of fruit per month, and the crop will probably double next season. Through the medium of the exchange better prices for the fruit will doubtless be realized.

So far as we can judge there has been no disease upon the walnut; the crop promises fair in quantity, but the nuts will average a little under size. The olive has a good showing, and the prospect is fair for the usual crop. For several reasons, chief among which is the decreased annual rainfall, there has been a far less acreage planted to trees this year than during either of the last two years.

Respectfully submitted.

T. N. SNOW,
Secretary.

Santa Barbara, September 22, 1896.

SANTA CLARA COUNTY.

To the Honorable State Board of Horticulture:

Gentlemen: I have the honor to submit for your kind consideration my annual report as Horticultural Commissioner of Santa Clara County.

I received my appointment in December, 1895, and at first was given a four months' term, at the end of which time some of our leading fruit-growers petitioned the Supervisors, asking that a permanent Commissioner be appointed, as the interests were so great as to demand that some one should always be at hand to consult on the different subjects of horticulture. This has been done.

This county has largely added to its acreage of orchards and vineyards in the last few years, and a rough estimate of the acreage of different fruits is as follows:

Variety.	Bearing.	Not Bearing.
Apples	252	48
Apricots	3,705	1,292
Cherries	835	640
Prunes	14,937	13,417
Plums	353	75
Peaches	3,109	1,824
Pears	936	387
Quinces	12	2
Olives	75	84
Oranges and lemons	9	22
Figs	12	8
Almonds	160	65
Walnuts	63	45
Berries	400	-----------

Total area in fruit .... 42,767 acres.

The crops of 1896 can be put as follows: Apples a medium crop, apricots very short, cherries very short, peaches good crop, pears good crop, prunes about a third of a crop. It is too soon to make an estimate of the tonnage of fruits produced, as a great deal of fruit is being dried and very little of it has been sold up to date.

A very large industry here is seed-farming, and over 2,000 acres are annually planted, onions and lettuce being mostly raised, but other vegetables and flower seeds also, in limited quantities.

During planting season there were sent into this county the following nursery stocks:

Deciduous trees	91,513
Citrus	500
Rooted grapevines	2,100
Ornamentals	2,675

From the State of Oregon, 14,075 deciduous trees and 3,300 berry plants, and from France and the Eastern States, 85,000 seedlings for nursery stock.

All the apple and pear stocks were dipped. One shipment, direct from Japan, contained 810 ornamentals, and all these were fumigated.

There are four insects in particular which trouble us in this county, and I mention the peach-root borer (*Sannina pacifica*) as the most troublesome. This pest has spread into several new districts and has caused a great deal of annoyance to growers. During this season it has been fought vigorously, and I believe will give less trouble in the future. The best remedy is pine tar diluted with fish oil, two parts to one, and applied below ground on the trunk, and a thick whitewash put on the trunk above ground. Wherever this has been tried good results have been obtained.

A green vine-hopper (*Tettigonia circellata*) is causing a great deal of trouble in the vineyards. Being a sucking insect, it is hard to fight. Good results have been obtained by trapping. This is accomplished with a canvas bag in the morning when the insects are still numb. To illustrate the efficiency of the trap, I have known of instances where 30 pounds of insects have been captured in a day; and when we consider that 13 hoppers weigh 2 grains, or about 43,500 to the pound, the capture very soon runs into the millions. Where these insects are abundant the leaves of the vines have a curled and dwarfed appearance. The traps can only be used as long as the vine runners are short, and during this time trapping must be kept up. To make a bag, two yards of light canvas, one yard wide, are used. Two sides are left open, and on the edges of one side, two thirds the length, a lath is nailed.

The black scale (*Lecanium oleæ*) is still a pest in our deciduous orchards, infesting the prune, apricot, and peach trees. I find that the *Rhizobius ventralis* has done a great deal in eradicating this pest in olive orchards, and although I find some decrease in deciduous orchards, and find the ladybirds present in small numbers and in all stages, yet it seems there is something preventing the insect from freeing the trees of the scale.

A few vineyards have been attacked by the phylloxera, and wherever found the vines have been pulled up.

Among the periodical insects we have the cankerworm, for which we now use the wire-mesh tray very successfully, especially when the grower has attended to the details.

The Hessian fly was not as bad as last year, but wherever infested seed was planted the field did not produce a crop.

Pear blight troubles us only in moist localities. The root knot is not as plentiful as a few years ago. All infested young trees are thrown out in the nursery.

Through the kindness of Prof. J. B. Smith, of the New Jersey Experiment Station, I received five colonies of *Coccinella 9-notata*, a ladybird which is a very promising aphis-eater. These colonies have been liberated in this county, and I expect good results from them. In turn I have sent colonies of our *Comys fusca*, parasite of the apricot scale (*Lecanium armeniacum*), to New York, Canada, and New Jersey, to breed on the New York plum scale (*Lecanium juglandis*).

Respectfully submitted.

ED. M. EHRHORN,
Commissioner.

San José, September 12, 1896.

STANISLAUS COUNTY.

To the Honorable State Board of Horticulture:

Gentlemen: During the year ending September 1, 1896, I have visited nearly all the orchards in Stanislaus County, and find that the infested orchards which were sprayed have been greatly improved, and that the *Vedalia cardinalis* has almost eradicated the cottony-cushion scale, which was very plentiful in the orchards and yards of Modesto.

The fruit industry is gradually increasing, there having been several thousand trees and vines planted this year.

Of the shipments of trees and plants which came into this county this season, all were free of pests but two, one of which was destroyed by burning; and the other was disinfected and rendered free from insects.

The fruit crop was small, about one half the usual amount. Apricots, grapes, berries, and peaches were scarce, but the pear and apple crops were large. Oranges and lemons are almost a failure.

I find it very up-hill work to fight the codlin moth, and there seems to be little, if anything, done in that line in our neighboring counties.

I have found it very necessary to keep a close watch on all citrus fruits coming from commission houses in San Francisco, Stockton, and Sacramento, as they were continually shipping into our county, from the southern part of the State, fruit badly infested with "red scale," a species which we have the good fortune to be without.

The nurserymen of this county are very cautious about allowing any pests or insects in their nurseries. I inspect all of them before allowing any nursery stock to be removed from them during planting season.

Respectfully submitted.

A. L. RUTHERFORD,
Commissioner.

Modesto, September 1, 1896.

TEHAMA COUNTY.

To the Honorable State Board of Horticulture:

Gentlemen: We herewith present to you our annual report as County Horticultural Commissioners of Tehama County.

During the past twelve months we have visited many of the orchards in this county, and especially those in localities where the trees were known to be infested with pests. Through the labors of the Horticultural Commissioners and the mutual aid of the orchardists, good results have been effected in eradicating the San José scale, which at one time threatened to destroy the fruit interests of the county. We find that the sulphur, lime, and salt mixture has proven sufficient to destroy all scale; frequently one thorough spraying with this remedy has left the trees clean and free from scale, but we recommend a second application a year later. When sufficiently diluted as to not injure the foliage, we have used this remedy successfully as a summer wash.

We cannot be too careful in protecting our orchards against that dread disease known as "yellows," which exists in many of the Eastern States, and all peach trees or stock grown on peach roots, grafts, and buds from where this disease is known or liable to be, should be excluded from our State.

The root knot is becoming quite a serious trouble, especially to almond trees planted on heavy soils, the greatest loss being in bearing trees, as this Commission has by stringent quarantine regulations deterred shipments into this county of poor or diseased trees. Horticultural Commissioners of other counties are generally very careful in inspecting nursery stock, judging from the clean and healthy trees received by our orchardists last season, yet we request nurserymen to inspect their stock still more carefully and send out only good trees for planting, for upon them the fruit-growers must depend for future profits.

The codlin and peach moths have done some injury. The Muir peach seems to have been attacked by the moth more than any other variety. The red spider and yellow mite have damaged the almond and prune to some extent.

The fruit crop of Tehama County, owing to the late cold spring and long warm summer, has been greatly damaged; the amount, in our opinion, after a careful estimate, will not reach one fourth of a crop, and the fruit is generally of small size and inferior quality.

This county embraces some of the finest fruit soils in the State. The soils are alluvial and volcanic. The altitude and climate are such that both citrus and deciduous fruits can be produced in abundance and to perfection. Apples, pears, prunes, and peaches grown in our mountain and foothill districts are equal if not superior to those grown in the Eastern States, while in the valleys the orange and lemon thrive side by side with all of the hardier trees. The water-supply is sufficient to irrigate all the valuable land wherever needed. Although prices have been low during the past two or three seasons, our fruit-growers are not discouraged and planted largely last year, and contemplate doing the same the coming year.

Respectfully submitted.

EZRA CROTZER,
Commissioner.

Red Bluff, September 19, 1896.

VENTURA COUNTY.

To the Honorable State Board of Horticulture:

Gentlemen: The County Board of Horticultural Commissioners of Ventura County respectfully submit their annual report.

The citrus fruit interests are in excellent condition, we would say perfect condition, were it not for the fact that black scale is getting into the young orchards in Sespe, Fillmore, Bardsdale, and Nordhoff. The ladybird (*Rhizobius ventralis*) has been liberated in these orchards repeatedly, but the climate seems to be too hot for them, for they do not increase. Near the coast this ladybird cleans citrus and olive trees from black scale, and is cleaning the hemispherical scale from the pepper trees. The large orange orchard at Santa Paula, owned by N. W. Blanchard, was never so clean before, and the cleaning has been done by the twice-stabbed ladybird, the black ladybird, the chalcid fly, and the lace-wing fly. All of the red, purple, and other bad scales have been exterminated by burning as soon as found, and this policy will probably be kept up as long as a Commission exists in the county. What has been said of black scale on citrus trees applies also to olive trees: the *Rhizobius* is cleaning the orchards near the coast, but not at Nordhoff and Sespe. The farthest orchard from the coast in which they have done good work is at Santa Paula, sixteen miles.

The deciduous fruit interests are in better condition than they ever were before, being troubled with but one pest, the codlin moth, which is slowly spreading. The pernicious scale was introduced before a Commission was appointed, and obtained a strong foothold in many orchards, but it has been reduced to very small proportions by the use of the lime, salt, and sulphur wash. No new pests have been discovered. We still have a local inspector at each depot to inspect all trees coming into the county, but have not ordered a general inspection of the orchards this year, because we knew that no scale could get much of a start in one year, and wished to avoid all unnecessary expense.

W. I. RICE, President,
J. F. McINTYRE, Secretary,
T. A. RICE,
Commissioners.

Ventura, September 12, 1896.

YUBA COUNTY.

To the Honorable State Board of Horticulture:

Gentlemen: I herewith present to the State Board of Horticulture the report of the Horticultural Commissioner of Yuba County for the term ending October 1, 1896.

The horticultural interests of Yuba County are in a fairly thrifty condition. During the past year the work of the Horticultural Commissioner's office has been somewhat restricted, owing to a scaling down of expenses by the Board of Supervisors. As far as it was possible, however, a careful watch was kept on the various fruit-growing districts of the county for the purpose of ascertaining the condition of insect pests.

The commercial groves in the valley part of the county, both deciduous and citrus, are practically free from the devastating species of injurious insects.

In the Wheatland district, which is rapidly becoming a very important horticultural center, fruit trees are remarkably free from injurious insect pests, and in very thrifty shape. The San José scale, which at one time had gained a footing there, has disappeared, owing to the careful spraying of the trees by the growers.

In the apple-growing regions in the mountainous part of the county no inspections were made during the past year, owing to the restrictions on expenses of this office. Reports from those districts, however, would indicate that the San José scale was not so numerous as formerly, but that the codlin moth was still a very serious pest. A bulletin on the subject of the codlin moth was prepared and sent out from this office, giving full information as to the habits and life-history of this insect, together with an account of the best remedies to use for its suppression. On account of a very short apple crop this year, occasioned by frosts, it was not possible to learn whether or not there had been a decrease in the codlin moth pest.

The citrus trees in the City of Marysville are still infested with the yellow scale. Early in the year it was observed that the scale had decreased in numbers to a very large extent; the scale appeared to be rapidly disappearing, which fact was attributed to the work of the chalcid fly, which had been successfully introduced here. As the season advanced, and especially during the latter part of the summer, the scale seemed to commence to multiply again, although the chalcid flies were present in large numbers. At the present time the infested trees are under careful observation, and it may be possible to determine, later in the year, whether the chalcid flies are to have any permanent effect on the scale or not.

Respectfully submitted.

G. W. HARNEY,
Commissioner.

MARYSVILLE, October 1, 1896.

INDEX.

PAGE.

- ACKNOWLEDGMENTS 62
- ATTORNEY-GENERAL—Opinion of 19

- BLACK WALNUT 102
  - Varieties of 102
- BOARD—Removal of offices 21
- BUCK, L. W.—Resolutions in memoriam 14

- CRAW, ALEXANDER—Description of insects by 33
  - Reports of 127-135
- CURRANTS, ZANTE—Case before court, etc. 75

- DEFICIENCY 18

- EXCHANGES—Citrus fruit 71
- EXPENDITURES 22

- FREE PUBLIC MARKET 72
- FRUIT SEASON 1895-96—Review of 67
- FRUIT SHIPMENTS 70
  - Of 1895 73-74

- INSECT PESTS—Foreign 33-52
  - Liable to be introduced 23
  - Remedies for 31
- INSPECTION OF STEAMERS 27-32
- INVENTORY—Property of Board 16-17

- LAWS—State, relating to horticulture 1
  - State, relating to County Boards 3
  - Amendment unconstitutional 5
  - Enforcement thereof, court's decision, etc. 5
  - Quarantine regulations 7
  - Enforcement of quarantine regulations 9
- LELONG, B. M.—Report of 67-116

- PARTITIONS—Opinion of Attorney-General as to moving 19
- PROPERTY OF BOARD—Inventory of 16-17
- PUBLIC FRUIT MARKET 72

- RED SPIDER 107
- REMEDIES FOR INSECT PESTS, FUNGI, ETC. 56
- REMOVAL OF OFFICES 21
- REPORT—B. M. Lelong 67-116
  - Alexander Craw 127-135
- REPORTS OF COUNTY BOARDS OF HORTICULTURE 139
  - Fresno 139
  - Los Angeles 141
  - Merced 142
  - Orange 142

REPORTS OF COUNTY BOARDS OF HORTICULTURE—Continued. PAGE.
- Placer ---- 144
- Riverside ---- 144
- Sacramento ---- 146
- San Bernardino ---- 147
- San Diego ---- 149
- San Joaquin ---- 151
- San Mateo ---- 154
- Santa Barbara ---- 155
- Santa Clara ---- 156
- Stanislaus ---- 158
- Tehama ---- 159
- Ventura ---- 160
- Yuba ---- 160

SANDERS, S. P.—Paper by ---- 121
SHIPMENTS OF FRUIT ---- 70
STATE BOARD OF HORTICULTURE—Transactions of ---- 11
STEAMERS—Inspection of ---- 27–32

WALNUT INDUSTRY IN CALIFORNIA, THE ---- 77
- Annual and biennial crops ---- 106
- Aphis ---- 109
- Area in State ---- 111–113
- Bacteriosis ---- 109
- Black, varieties of ---- 102
- Broad-neck borer ---- 108–109
- Budding ---- 98–99
- Commercial grades ---- 106
- Commercial importance ---- 77
- Cultural range in United States ---- 113
- Enemies of ---- 107
- English ---- 85
- European varieties ---- 86
- Fertilizers for ---- 96
- Grafting ---- 99–102
- Harvesting ---- 105
- In Europe ---- 114–116
- In oak land ---- 94
- Oriental varieties ---- 90
- Origin of home varieties ---- 84
- Planting, soil, etc. ---- 91
- Pollination ---- 81
- Propagation ---- 97
- Pruning ---- 104
- Root knot or galls ---- 111
- Scale ---- 108
- Span worm ---- 109
- Soil exhaustion, etc. ---- 96

YELLOW MITE ---- 108

ZANTE CURRANT—Case before court, etc. ---- 75

REPORT OF TRUSTEES

OF

STATE NORMAL SCHOOL,

SAN JOSE,

FOR THE

YEARS ENDING JUNE 30, 1895, AND JUNE 30, 1896.

SACRAMENTO:
A. J. JOHNSTON, : : : : SUPERINTENDENT STATE PRINTING.
1896.

REPORT.

Office of the Board of Trustees of the
State Normal School at San José, October, 1896.

To his Excellency James H. Budd, *Governor:*

We herewith submit to your Excellency the following report of receipts and expenditures for the support of the State Normal School at San José, under our charge, for the forty-sixth and forty-seventh fiscal years.

In our efforts to faithfully discharge the duties of the trust confided to us, we have conscientiously labored for the highest possible state of efficiency at the minimum of expense. We have endeavored to conduct the business of the State with the same economy, prudence, and care that we apply to our private affairs.

The estimates for the forty-ninth and fiftieth fiscal years, made by the Trustees at a special meeting called for that purpose, after a most thorough examination of the property and deliberation as to the actual requirements of the school, are as follows:

Support	$100,000 00
Library	2,000 00
Laboratories and equipment	3,000 00
Grounds	9,000 00
Repairs	2,000 00
Re-seating Hall	3,000 00
Gymnasium	10,000 00
	$129,000 00

In submitting these estimates for your consideration, we have made no inflation with a view to reduction, but have asked for the lowest amount possible to conduct the school in its highest state of efficiency and usefulness.

The Board begs to suggest that the change from the old text-book method of instruction to the modern method of practical work in the laboratory, has, in all the colleges and higher schools of the United States, involved a greatly increased outlay for the fittings and improvements of class-rooms.

The appropriation asked for the grounds includes an item of $3,000 for the relaying of ground pipes for sprinkling and fire protection to replace the present system, which has rusted out and become worthless. The remaining $6,000 asked for, for the care and maintenance of the grounds is a sum which the Board feels is wholly disproportionate to the other expenses of the school. If expended in laboratories or for salaries of additional teachers, it would be educationally of great value. If, however, the twenty-eight acres belonging to the school are to be put and maintained in a condition which will be creditable to a State institution and acceptable to the city in which the grounds are located, the Board is of the opinion that the sum designated is necessary.

The Trustees have long recognized the necessity for a gymnasium building to promote the health and physical development of our students. The Catalogue of the School advises candidates for admission that "It is useless to attempt to complete the severe course of study prescribed unless you have good bodily health;" again, in our Rules and Regulations, students are told that "It will be impossible for you to do the work required unless you preserve good bodily health." Throughout the course the greatest stress is laid upon the preservation of bodily health. At the same time no practical measures are taken to insure the bodily health of the students. Gymnastic and calisthenic exercises attempted in one of the halls of the school had to be given up on account of the noise and shaking of the building. In asking for an appropriation of $10,000, the amount appropriated in 1889 for a gymnasium building at the State Normal School at Los Angeles, the Board feels that they are asking money for educational purposes, for not only will a gymnasium be of direct benefit to the students of this school, but an indirect benefit to all schools in which they may hereafter teach.

HENRY FRENCH,
M. DINKELSPIEL,
F. ANGELL,
R. E. WILHOIT,
E. A. WILSON,
Trustees.

ELIZABETH BLASDEL, Secretary.

FINANCIAL REPORT.

FOR THE FORTY-SIXTH FISCAL YEAR, ENDING JUNE 30, 1895.

GENERAL FUND.

Receipts.

Amount of appropriation for support, forty-sixth fiscal year	$45,000 00
Balance in Tuition Fund from forty-fifth year, as per last report	1,114 87
Tuition received during forty-sixth fiscal year	3,770 00
Amount received from sale of old boiler	155 00
Amount received for duplicate diploma fees	2 50
	$50,042 37

Disbursements.

Date of Auditing. 1894.		
July 31	Salaries for July, 1894	$3,508 29
	Chris Hirth, plumbing supplies	9 60
Aug. 31	J. W. Anderson, slating blackboards	47 37
	A. D. Daunes, coal	210 35
	S. C. V. M. & L. Co., lumber	31 42
	J. W. Anderson, calcimining and papering	8 50
	Sunset Telephone-Telegraph Co., rent and service, July and August	11 29
	San José Oil Co., oil	2 20
	J. J. Zingg, locksmithing	1 75
	Miner & Van Sant, hardware	5 40
	Schemmel & Pfister, repairing piano	1 50
	W. T. Garratt & Co., pipe, etc., for grounds	190 25
	J. A. Belloli, wood	46 00
	S. C. V. M. & L. Co., lumber for grounds	32 42
	Geo. B. McKee & Co., paint and oil	37 05
	Howell & Knowles, painting smokestack	7 00
	Homer Prindle, repairing cart	7 25
	P. J. Maguire, freight and cartage	6 49
	Miner & Van Sant, hose, tools, and hardware for grounds	33 80
	Geo. W. Hanson, asphalt floor for engine-house	178 68
	Salaries for August, 1894	3,508 29
Sept. 28	Salaries for September, 1894	3,508 29
	A. D. Daunes, coal	211 62
	W. J. Kirkpatrick Co., stationery, ink, etc.	23 50
	A. Steiger Sons, modeling-clay	14 75
	J. C. Black & Son, janitor supplies	12 80
	Carson-Riley Drug Co., medicinal supplies	9 50
	Farmers' Union, supplies for grounds	9 79
	John Goetz, sawing wood	8 80
	Mercury Printing and Publishing Co., advertising	4 50
	Luke McClellan, blacksmithing	2 50
	McNeil Bros., cardboard and printing	8 50
	McNeil Bros., postal cards and printing	6 50
	Payot, Upham & Co., kindergarten supplies	5 10
	Farthing Manufacturing. Co., penwipers	2 50
	L. Aubert, cleaning and relaying carpet	20 16
	Sunset Telephone-Telegraph Co., rent and service, September	4 35

General Fund—Continued.

1894.		
Oct. 31—	Salaries for October, 1894	$3,508 29
	A. D. Daunes, coal	477 98
	R. N. Mason & Co., oil for engine	51 75
	S. J. Ind. M. & L. Co., lumber	14 12
	E. B. Lewis, stationery supplies	10 45
	W. J. Kirkpatrick Co., paper, etc.	8 30
	M. M. Haas Co., stationery	6 62
	C. F. Weber & Co, ink-wells	3 00
	S. H. Wagener, chemical supplies	10 92
	John Stock Sons, plumbing supplies	8 45
	Miner & Van Sant, hardware	12 65
	Geo. B. McKee & Co., dusters and lettering	7 85
	Denny & Bentley, lettering	4 50
	San José Light and Power Co., gas	12 60
	Sunset Telephone-Telegraph Co., rent and service, October	5 90
	J. C. Black & Son, supplies	8 40
	H. L. Miller, manilla paper	3 50
	J. A. Belloli, wood	78 00
	John Stock Sons, plumbing supplies for grounds	45 93
	W. T. Garratt & Co., repairing pump	25 90
	San José Foundry, iron work	12 85
	Miner & Van Sant, hardware for grounds	4 77
	C. H. Gorr, traveling expenses for school	4 25
	C. F. Allen & Co., ball for gymnasium	4 50
	Miner & Van Sant, hardware for gymnasium	2 64
	S. J. Ind. M. & L. Co., lumber for gymnasium	17 40
	P. S. Maguire, freight hauling on gymnasium apparatus	23 40
Nov. 28—	Salaries for November, 1894	3,508 29
	F. Kuchenbeiser & Son, iron work	27 60
	West Disinfecting Co., disinfectors and oil	15 00
	Buchanan Bros., floor brushes	14 00
	Foss & Hicks, revenue brokerage, purchase of alcohol	7 50
	Geo. B. McKee & Co., painting supplies and glazing	7 00
	Sunset Telephone-Telegraph Co., rent and service, November	6 40
	Miner & Van Sant, school supplies	3 45
	San José Oil Co., oil	2 20
	Chris Hirth, plumbing supplies	27 75
	F. Kuchenbeiser & Son, iron work	11 10
	C. R. Hanaford, hay	2 85
	Miner & Van Sant, tools and hardware for grounds	6 85
	Miner & Van Sant, rope for gymnasium apparatus	6 50
	Narragansett Machine Co., gymnasium apparatus	199 31
Dec. 19—	J. Q. Pearl, hay	22 83
	A. S. Hanks, horseshoeing	1 50
	C. F. Weber & Co., ink-wells	2 00
	F. E. Smith, clock and repairs	13 00
	Kate Cozzens, expenses for gymnasium	6 55
	J. A. Belloli, wood	55 25
	Sunset Telephone-Telegraph Co., rent and service, December	6 80
	R. Hellwig, electrical supplies	5 00
	C. H. Ashworth, supplies	3 95
Dec. 31—	Salaries for December, 1894, and salary of Secretary, six months	3,583 29
1895.		
Jan. 30—	Salaries for January, 1895	3,754 94
	A. D. Daunes, coal and cement	480 07
	E. P. Main, wood	13 00
	San José Light and Power Co., gas	30 60
	Milton Campbell, repairing roof and gutters, and plumbing supplies	111 60

1895.	General Fund—Continued.	
Jan. 30—	O. M. Tupper, brick and cement	$25 96
	California Distilling Co., alcohol	61 76
	Bosqui Engraving and Printing Co., diplomas	40 65
	Ruth Royce, Secretary, postage, express etc., seven months	50 35
	E. B. Lewis, stationery supplies	9 30
	Farmers' Union, brooms	1 75
	Sunset Telephone-Telegraph Co., rent and service, January	6 40
	J. J. Zingg, locksmithing	7 00
	Bertha Warren, lettering diplomas	14 25
	Milton Campbell, plumbing supplies for grounds	21 75
	Farmers' Union, supplies for grounds	23 67
	S. C. V. M. & L. Co., lumber for school gymnasium and grounds	142 57
	Miner & Van Sant, hardware for gymnasium and grounds	7 00
	C. W. Childs, traveling expenses	15 00
Feb. 28—	Salaries for February, 1895	3,671 61
	San José Light and Power Co., gas	20 40
	Sunset Telephone-Telegraph Co., rent and service, February	7 30
	M. M. Haas Co., crayon, etc	18 50
	A. Steiger Sons, modeling-clay	10 40
	O. A. Hale & Co., toweling	6 20
	J. C. Black & Son, supplies	6 55
	L. Callisch, medicinal supplies	3 75
	C. H. Ashworth, supplies	3 50
	G. C. Church, sawdust	2 50
	San José Furniture Manufacturing Co., repairing sofa	3 00
	Sundry papers, advertising	2 00
	R. Royce, Secretary, Commencement expenses	2 00
	J. P. Jarman, glazing	7 40
	Mangrum & Otter, supplies	2 20
	C. W. Childs, traveling and miscellaneous expenses	18 70
	John Stock Sons, plumbing supplies	9 81
	San José Foundry, iron work for grounds and gymnasium	27 30
	Geo. B. McKee & Co., painting supplies and glazing	11 65
	Miner & Van Sant, hardware for building and grounds	19 10
	Milton Campbell, repairing roof, plumbing supplies, etc.	26 65
	F. Kuchenbeiser & Son, iron work	3 75
	R. J. Baker, barley seed	10 10
	John Goetz, sawing wood	2 80
Mar. 29—	Salaries for March, 1895	3,671 61
	A. D. Daunes, coal	354 79
	Buchanan Bros., floor brushes	10 00
	Payot, Upham & Co., kindergarten material	4 30
	Peerless Oil Co., oil	2 00
	S. C. V. M. & L. Co., glazing	3 50
	Sunset Telephone-Telegraph Co., rent and service, March	5 00
	O. A. Hale & Co., sheeting	1 70
	May Warnock, typewriting and stenography	5 00
	Payroll on grounds, March, 1895	156 00
	E. Bourguignon, plants for grounds	15 85
	R. F. English, rent of piano, repairing and moving same	50 00
April 30—	Salaries for April, 1895	3,671 61
	Henry French, Trustee, mileage attending joint meeting at Chico	44 60
	Mrs. E. A. Wilson, mileage attending joint meeting at Chico	36 00
	F. Angell, Trustee, mileage attending joint meeting at Chico	41 20
	R. E. Wilhoit, Trustee, mileage attending joint meeting at Chico	28 80
	M. Dinkelspiel, Trustee, mileage attending joint meeting at Chico	27 40
	W. J. Kirkpatrick Co., stationery	18 64
	Miner & Van Sant, hardware	5 85

1895. GENERAL FUND—Continued.

April 30—	Henry French, sundry expenses	$4 70
	Cal. N. C. A. Gas Co., gas	3 00
	M. Breeman, services as gardener, April, 1895	52 00
	C. W. Childs, traveling expenses, joint meeting	11 50
	Herald Publishing Co., advertising	3 50
	Jas. Harlow, sharpening	50
	Sunset Telephone-Telegraph Co., extra switching, Feb. and Mar.	4 00
May 31—	Salaries for May, 1895	3,671 61
	San José Light and Power Co., gas	19 80
	Ruth Royce, Secretary, postage, etc., four months	29 95
	McNeil Bros, postal cards	6 75
	Geo. B. McKee & Co., glazing	4 50
	A. Burntrager, brooms	1 75
	J. C. Black & Son, towel rollers	1 40
	A. D. Daunes, coal	198 08
	J. A. Belloli, wood	40 10
	J. P. Jarman, painting supplies	19 30
	S. C. V. M. & L. Co., glazing and lumber	6 97
	M. Breeman, services as gardener, May, 1895	54 00
	F. Kuchenbeiser & Son, iron work	13 50
	Mangrum & Otter, plumbing supplies	12 89
	Homer Prindle, repairing tools	4 25
	Denny & Pitman, lettering signs	2 00
	David Wright, part payment, services examining heating apparatus	5 89
	Mrs. A. E. Bush, Museum expenses	6 55
	Hausser & Marsky, bookbinding	16 35
	Comstock Publishing Co., Entomology	3 15
June 14—	Mrs. E. P. Anderson, flag	18 00
June 26—	Salaries for June, 1895, and salary of Secretary, six months	3,746 61
	Bosqui Engraving and Printing Co., diplomas	70 55
	M. M. Haas Co., stationery	49 33
	McNeil Bros., printing	14 50
	A. R. Denike, tuning	10 00
	J. C. Black & Son, supplies	2 90
	A. H. Martin, ribbon	1 60
	Mr. Breeman, gardener, services, June, 1895	50 00
	Joseph Jenkin, assistant gardener, services, June, 1895	50 00
	P. J. Peterson, cutting and raking hay	24 00
	Joseph Brodrick, making hay	9 00
	Farmers' Union, barley and packing	9 90
	S. C. V. M. & L. Co., lumber	13 97
	H. M. Allender, carpenter work	2 75
	Bertha Warren, lettering diplomas	24 75
	Ruth Royce, Secretary, postage, express, etc., June	22 05
	Geo. Denne, glazing and frame	4 90
	Miner & Van Sant, hardware	3 10
	Scott & Brown, repairing drum	2 75
	C. A. Murdock & Co., printing	22 00
	Bolton & Strong, photo engraving	22 75
	Ruth Royce, Secretary, expenses for catalogue	13 30
	Sunset Telephone-Telegraph Co., rent, etc., April, May, and June	13 35
	Total amount expended	$48,927 64
	Balance in Tuition Fund	1,114 73
	Total	$50,042 37

SPECIAL APPROPRIATION FOR CARE OF GROUNDS, LIBRARY, MUSEUM, AND SCIENTIFIC APPARATUS.

Receipts.

	Amount of appropriation	$2,500 00

Date of Auditing. 1894.	*Disbursements.*	
July 31	—Payroll on grounds, July, 1894	$152 00
Aug. 31	—Payroll on grounds, August, 1894	196 50
Sept. 28	—Payroll on grounds, September, 1894	150 00
	Hausser & Marsky, bookbinding	50 70
	D. Appleton & Co., "Art of the World," 12 Nos.	12 00
	Cunningham, Curtis & Welch, books	4 34
	F. M. Hausted, San José Directory	4 00
	L. P. McCarty, "Statistician"	75
	M. M. Haas Co., books	484 69
Oct. 31	—Payroll on grounds, October, 1894	156 00
	M. M. Haas Co., books and periodicals	73 30
	D. C. Heath & Co., books	3 78
	Garretson, Cox & Co., "Current History"	2 00
	U. S. Clark, carpenter work (bookcase)	6 00
	Bert Biglow, painting and graining bookcase	3 50
Nov. 28	—Payroll on grounds, November, 1894	174 00
	S. F. Junkin, "Century Cyclopædia of Names"	13 00
	D. Appleton & Co., books	10 00
	University of California, books	2 50
	Publisher's Weekly, "Trade List Annual"	2 60
Dec. 19	—Dodd, Mead & Co., "International Cyclopædia"	57 00
	Hausser & Marsky, bookbinding	49 60
	L. I. Subscription Agency, periodicals	26 85
	J. P. Greeley, Proceedings California Teachers' Association	3 00
Dec. 31	—Payroll on grounds, December, 1894	156 00
1895.		
Jan. 30	—Payroll on grounds, January, 1895	229 00
	Hausser & Marsky, bookbinding	19 90
	Funk & Wagnalls, "Standard Dictionary"	8 78
	D. Appleton & Co., "Art of the World," 6 parts	6 00
	Poole Bros., Astronomical Map and Index	3 50
	A. Florence Smith, books	2 62
	Mrs. A. E. Bush, Museum expenses	38 55
	Directors' Old South Studies, History Leaflets	3 67
Feb. 28	—Payroll on grounds, February, 1895	150 75
	Johnson & Emigh, books	79 39
	Ruth Royce, librarian, cash paid for books, etc., for library	13 20
	Puritan Publishing Co., "Dictionary U. S. History"	4 75
Mar. 29	—Library Bureau, library supplies	22 25
	Z. Richards, books	10 50
	Publishers' Weekly, books	7 61
	E. C. Rodwick, "Footprints of Four Centuries"	3 00
	F. P. Montgomery, map	10 00
April 30	—Miner & Van Sant, repairing lawnmower	13 00
	Hausser & Marsky, bookbinding	44 85
	Comstock Publishing Co., Entomology	2 00
	M. M. Haas Co., books	8 09
May 31	—Mrs. A. E. Bush, Museum expenses	24 48
	Total	$2,500 00

SUMMARY OF REPORT.

Total income, forty-sixth fiscal year		$52,542 37
Paid for salaries of teachers, secretary, janitor, and engineer	$43,312 73	
Paid for stationery	160 79	
Paid for books, periodicals, and bookbinding	1,056 22	
Paid for furniture and apparatus	46 20	
Paid for fuel and gas	1,705 82	
Paid for general supplies	456 20	
Paid for repairs and improvements	492 72	
Paid for fitting up gymnasium and gymnasium apparatus	330 98	
Paid for museum expenses	82 28	
Paid for traveling expenses	219 50	
Paid for miscellaneous expenses	374 73	
Total expended for support of school		$48,238 17
Paid for payrolls and labor on grounds	$1,759 25	
Paid for pipes and plumbing supplies	306 27	
Paid for hose, tools, and hardware	57 47	
Paid for general supplies for grounds	79 14	
Paid for fuel for grounds	557 57	
Paid for repairs and improvements on grounds	232 35	
Paid for asphalt floor for engine-house	178 68	
Paid for miscellaneous expenses on grounds	18 74	
Total expended for care and improvement of grounds		3,189 47
Balance in Tuition Fund		1,114 73
Total		$52,542 37

SPECIAL APPROPRIATION TO PAY DEFICIENCY IN APPROPRIATION FOR HEATING AND VENTILATING APPARATUS FOR TRAINING DEPARTMENT ANNEX.

Receipts.

Amount of appropriation	$3,000 00

Disbursements.

Date of Auditing. 1895.		
May 31	Geo. H. Tay Co., enlarging and completing apparatus, per contract	$2,820 00
	David Wright, part payment examining heating apparatus	4 11
	Unexpended balance, June 30, 1895	175 89
	Total	$3,000 00

RUTH ROYCE,
Secretary Board of Trustees, State Normal School, San José, for forty-sixth fiscal year.

FOR FORTY-SEVENTH FISCAL YEAR, ENDING JUNE 30, 1896.

GENERAL FUND.

Receipts.

Amount of appropriation for support, forty-seventh fiscal year	$45,000 00
Balance in Tuition Fund from forty-sixth year, as per last report	1,114 73
Tuition received during forty-seventh fiscal year	2,843 25
Amount received from University Extension Club for gas consumed	10 00
Amount returned by student for telegram	1 00
	$48,968 98

Disbursements.

Date of Auditing. 1895.		
July 31	Salaries for July, 1895	$2,841 63
	L. Aubert, cleaning carpets	15 00
	A. D. Daunes, coal	194 46
	Buchanan Bros., floor brushes	17 00
	Farmers' Union, janitor's supplies	12 90
	McNeil Bros., printing	10 68
	Geo. B. McKee, paints	1 40
	Ruth Royce, stamps, etc.	18 35
	L. P. McCarty, Statistician	4 00
	Joseph Jenkins, labor on grounds	54 00
	M. Breeman, labor on grounds	54 00
	H. W. Conkling, barley	1 30
	C. H. Ashworth, incidentals	3 85
	San José Light and Power Co., gas	24 60
	M. M. Haas Co., stationery	2 15
	Miner & Van Sant, hardware	7 35
	A. B. Coffey, address to Graduating Class	25 00
	— Rider, harness repairs	75
	Disinfectants	2 50
	Incidental expenses	28 00
Aug. 31.	Salaries for August, 1895	2,906 63
	G. B. McKee, paints	45 80
	Geo. H. Bentley, plastering	10 00
	J. A. Belloli, wood	48 00
	Rucker Bros., furniture	251 40
	M. M. Haas Co., stationery	13 35
	Bennett Bros., wood	6 50
	J. P. Jarman, painting, etc.	37 95
	Neville & Co., repairing flag	6 75
	G. B. McKee & Co., paints	2 15
	S. C. V. M. & L. Co., lumber	3 60
	D. A. McNash, repairing typewriter	1 75
	Sunset Telephone Co.	15 05
	M. M. Noble, postage, etc.	10 65
	M. Breeman, labor on grounds	54 00
	Joseph Jenkins, labor on grounds	54 00
	C. H. Ashworth, telegram	1 00
Sept. 30	Salaries for September, 1895	3,676 63
	A. D. Daunes, coal	198 48
	A. D. Daunes, general supplies	14 25
	Mangrum & Otter, hardware	44 24
	Gillespie Planing Mill Co., lumber	5 00
	San José Light and Power Co., gas	6 30
	C. F. Weber & Co., castings	36 05

1895.	General Fund—Continued.	
Sept. 30—	Marsky & Hess, bookbinding	$43 80
	M. M. Haas Co., books and stationery	100 50
	M. M. Haas Co., books	28 50
	C. H. Gorr, lime, etc.	4 00
	Murison & Wright, printing	6 00
	C. H. Ashworth, sawdust	3 00
	Joseph Jenkins, labor on grounds	50 00
	M. Breeman, labor on grounds	50 00
	Boschken Hardware Co., hardware	9 35
	Frank E. Smith, repairing clock	2 50
	Mercury Publishing Co., advertising	14 15
	M. M. Noble, incidental expenses	13 00
	Herald Publishing Co., advertising	5 30
Nov. 1—	Salaries for October, 1895	3,676 63
	Mangrum & Otter, hardware	3 00
	San José Furniture Co., furniture	98 25
	C. F. Weber & Co., erasers	33 15
	M. M. Haas Co., stationery	65 17
	M. M. Haas Co., periodicals	60 95
	M. M. Haas Co., books	105 93
	San José Light and Power Co., gas	8 70
	J. J. Zingg, locks and keys	1 75
	Boschken Hardware Co., hardware	3 80
	Farmers' Union, supplies	6 75
	McNeil Bros., printing	5 50
	M. Breeman, labor on grounds	54 00
	Joseph Jenkins, labor on grounds	54 00
	H. W. Conkling, barley	2 45
	"Evening News," advertising	5 60
	Burkett, Bennett & Nash, moving piano	4 00
	M. M. Noble, incidentals	14 65
	L. Callisch, drugs	6 50
	L. Lion & Sons, matting, etc.	14 10
	H. Prindle, repairing cart	12 00
	S. H. Wagener, laboratory supplies	21 98
	Marsky & Hess, bookbinding, etc.	3 50
	Monarch Oil Co., oil	1 80
	Murison & Wright, printing	2 25
	A. E. Ross, repairs to clock	8 50
Nov. 30—	Salaries for November, 1895	3,676 63
	San José Light and Power Co., gas	12 30
	Forum Publishing Co., subscription to "Forum."	3 00
	Smith & Stalder, coal	223 16
	M. M. Haas Co., books	44 85
	M. M. Haas Co., stationery	32 20
	M. Breeman, labor on grounds	52 00
	Joseph Jenkins, labor on grounds	52 00
	Boschken Hardware Co., hardware	1 65
	Telephone Co.	11 05
	J. J. Zingg, keys	2 00
	Kuchenbeiser & Sons, hardware	15 70
	M. M. Noble, supplies	32 60
	S. C. V. M. & L. Co., lumber	36 93
	Otto Krauss	1 25
	H. W. Conkling, barley	1 35
	San José Furniture Co., chair bottoms	2 80

General Fund—Continued.

1895.		
Dec. 19—	Salaries for December, 1895	$3,676 63
	E. P. Main, wood	16 00
	San José Light and Power Co., gas	9 90
	Schemmel & Pfister, repairs and tuning pianos	11 50
	M. M. Haas Co., stationery	39 76
	A. Steiger Sons, clay	8 65
	Dashaway Stables, livery	2 00
	Sunset Telephone Co.	4 00
	Miner & Van Sant, hardware	1 75
	Farmers' Union, shears, etc.	1 40
	H. L. Miller, mimeograph supplies	1 15
	Nolting & Co., disinfectant	5 00
	F. Kendrick, wood	9 00
	C. Hirth, blower-pipe	45 00
	M. Breeman, labor on grounds	52 00
	Joseph Jenkins, labor on grounds	52 00
	Bennett Bros., wood	16 00
	S. C. V. M. & L. Co., lumber	29 88
	M. M. Noble, supplies	8 30
1896.		
Jan. 23—	Salaries for January, 1896	3,584 97
	San José Light and Power Co., gas	19 20
	M. M. Haas Co., stationery	18 40
	George B. McKee & Co., papering and tinting	16 00
	Bosqui Engraving and Printing Co., eighty diplomas	66 40
	William Noble, wood	31 50
	M. M. Haas Co., periodicals	45 50
	"The Mercury," advertising contract	5 00
	Boschken Hardware Co., hardware	10 90
	Cornelia Walker, teachers' supplies	4 00
	L. H. Moise, rubber stamps	3 75
	M. M. Noble, supplies	38 50
	F. Brown, weighing coal	4 60
	Sunset Telephone Co.	7 80
	James H. Howard, horseshoeing	1 50
	Payot, Upham & Co., apparatus	8 50
	Monarch Oil Co., oil	5 00
	"Evening News," advertising contract	1 00
	"Herald," advertising contract	2 00
	Marsky & Hess, bookbinding	14 50
	C. A. Tupper, printing and advertising	7 00
Feb. 29—	Farmers' Union, oils, etc.	22 51
	Salaries for February, 1896	3,584 97
	Boschken Hardware Co., hardware supplies	11 35
	M. M. Haas Co., books	8 55
	Buchanan Bros., brushes and dusters	25 75
	San José Light and Power Co., gas	27 30
	M. M. Haas Co., stationery	88 85
	Industrial Home for Blind, two dozen brooms	6 00
	H. L. Miller, paper	3 00
	H. W. Conkling, barley	2 80
	H. Brosius, printing	3 25
	Stull & Sonniksen, ribbon	2 15
	John Taylor & Co., chemical apparatus	19 34
	Sunset Telephone Co.	14 00
	Justinian Caire Co., chemical apparatus	41 00
	E. G. Willyoung & Co., psychological apparatus	17 51

1896.	General Fund—Continued.	
Feb. 29—	G. G. Wickson & Co., typewriter	$75 00
	John Taylor & Co., chemical apparatus	372 26
	M. E. Blasdel, incidentals	30 50
	M. E. Blasdel, cash advanced	33 35
	S. C. V. M. & L. Co.	10 61
April 1—	Salaries for March, 1896	3,584 97
	M. M. Haas Co., stationery	27 12
	San José Light and Power Co., gas	17 55
	Schemmel & Brown, tuning piano	7 50
	Marsky & Hess, diploma rolls	1 00
	G. G. Wickson, typewriter table	8 00
	H. W. Conkling, hay and barley	2 70
	Boschken Hardware Co., hardware	5 65
	Fikes & Lean, hay	5 05
	John Taylor & Co., chemical apparatus	130 18
	Sunset Telephone Co.	13 75
	Justinian Caire Co., chemical apparatus	41 76
	Justinian Caire Co., chemical apparatus	50 15
	E. H. Guppy & Son, stationery	1 75
	Miner & Van Sant, supplies, hardware	4 53
	"The Fair," supplies for janitor	2 75
	J. J. Zingg, keys	2 00
	M. E. Blasdel, incidentals	19 35
	Brower & Son, printing	9 00
April 29—	Salaries for April, 1896	3,584 97
	M. M. Haas Co., stationery	36 83
	Bosqui Printing Co., 75 diplomas	62 25
	M. Dinkelspiel, mileage	17 80
	Dr. F. Angell, mileage	3 40
	Mrs. E. A. Wilson, mileage	8 40
	R. E. Wilhoit, mileage	16 00
	C. Hirth, hardware supplies	4 70
	Vendome Stables, carriage hire	18 00
	W. B. McCarley, hack hire	9 00
	Miss M. E. Blasdel, incidentals	16 95
	Bennett Bros., wood	6 50
	McNeil Bros., printing diplomas (Training Department)	2 70
	Sunset Telephone Co.	8 55
	Neville & Co., two American flags	28 05
	L. Lion & Sons, shades	15 00
May 27—	E. P. Main, one cord of wood	7 50
	San José Light and Power Co., gas	10 90
	Farmers' Union, supplies	9 95
	M. M. Haas Co., stationery	25 30
	Salaries for May, 1896	3,584 97
	John Taylor & Co., chemical apparatus	12 90
	John Taylor & Co., chemical apparatus	1 98
	Whitney Electrical Co., one volt meter	22 50
	Neville & Co., one American flag	13 50
	O. M. Tupper, one bbl. of lime	1 85
	Sunset Telephone Co.	7 35
	H. W. Conkling, barley and hay	6 55
	Milton Campbell, one garbage box	3 00
	M. E. Blasdel, incidentals	24 85
	J. E. Addicott, one blackboard	7 00
	Boschken Hardware Co., supplies	4 25
	Bolton & Strong, half-tone engraving	7 75

1896.	GENERAL FUND—Continued.	
June 24—	Salaries for June, 1896	$3,584 97
	M. M. Haas Co., stationery	36 73
	Bertha Warren, lettering 168 diplomas	42 00
	J. A. Belloli, 9 cords of wood	51 75
	Marsky & Hess, binding books	21 10
	O. A. Hale, 80 yards of toweling	8 80
	L. B. Wilson, chemical apparatus	13 64
	L. B. Wilson, chemical apparatus	15 40
	J. E. Addicott, plates for photos, etc.	9 62
	San José Furniture Co., cases for Physiology Department	31 50
	L. M. Washburn, frames for above cases	12 00
	San José Light and Power Co., gas (May)	10 05
	Sunset Telephone Co.	7 80
	H. W. Conkling, barley and hay	8 20
	A. H. Martin, bunting	16 65
	James G. Biddel, psychological apparatus	126 65
	John Taylor & Co., five Bunsen burners	1 75
	H. L. Miller, one ream of draughting paper	3 00
	Milton Campbell, garden hose	55 00
	John Edgar, extra labor on grounds	16 00
	C. H. Gorr, engineer	91 66
	John Taylor & Co., chemical apparatus	4 85
	H. P. Patterson, labor on grounds with team	40 50
	Mrs. A. E. Bush, Museum expenses	5 25
	M. E. Blasdel, incidental expenses	29 95
	Total amount expended	$47,631 70
	Balance in Support Fund	204 77
	Balance in Tuition Fund	1,132 51
	Total	$48,968 98

APPROPRIATION FOR CARE OF GROUNDS.

Receipts.

Amount of appropriation		$2,500 00

Date of Auditing. 1896.	*Disbursements.*	
Jan. —	Central Coal Co., 100 tons coal	$564 65
	Alviso Steamboat Co., freight on same	141 40
Jan. 23—	Smith & Stalder, coal	448 99
	Payroll on grounds, January, 1896	199 66
Feb. 28—	Payroll on grounds, February, 1896	191 66
	Chas. C. Navelett, seed	1 50
	H. P. Patterson, extra labor on grounds	21 00
	S. C. V. M. & L. Co., lumber for school	5 15
April 1—	Payroll on grounds, March, 1896	195 66
	Garden City Nursery, trees	57 50
	C. W. Childs, one plow for school	6 50
	H. P. Patterson, labor on grounds with team	45 00
	J. Q. Pearl, one ton of hay	9 50
April 29—	Payroll on grounds, April, 1896	195 66
May 27—	Payroll on grounds, May, 1896	195 66
	W. T. Garratt & Co., repairs to engine	36 80
	R. N. Nason, oil	51 75
	Nick Tolle, extra labor on grounds	22 00
June 24—	Payroll on grounds, June, 1896	104 00
June 30—	Balance remaining to our credit	5 96
	Total	$2,500 00

APPROPRIATIONS FOR REPAIRS.

Receipts.

Amount of appropriation	$5,000 00

Disbursements.

Date of Auditing. 1896.		
Jan. 10	—Robert Summers, work as per contract	$1,000 00
Jan. 23	—Glenwood Lumber Co., lumber for school	16 84
	S. L. Close, plastering	74 00
Feb. 29	—F. T. Holland, painting and varnishing	20 00
	J. B. Cambers, 16 dozen stools	92 00
	L. Lion & Sons, carpet	126 00
	J. P. Jarman, paints	17 15
	C. Hirth, plumbing	17 75
April 1	—Robert Summers, work as per contract	736 00
	Glenwood Lumber Co., work on Laboratory benches	372 88
	S. C. V. M. & L. Co., repairs, mouldings, etc.	9 50
	W. P. Fuller & Co., glass for chemical laboratory	15 50
	John Stock Sons, hardware supplies	3 01
April 29	—Robert Summers, work as per contract	580 00
	Jacob Lenzen & Son, supt. work in laboratories	125 80
	J. P. Jarman, paints	38 05
	S. C. V. M. & L. Co., lumber and glass	6 20
May 27	—S. C. V. M. & L. Co., lumber for school	19 00
	Unexpended balance, June 30, 1896	1,730 32
	Total	$5,000 00

SUMMARY OF REPORT.

Total income, forty-seventh fiscal year		$56,468 98
Paid for salaries of teachers, Secretary, janitor, and engineer	$42,514 56	
Paid for books, periodicals, and bookbinding	404 68	
Paid for stationery and printing	525 89	
Paid for furniture	352 45	
Paid for apparatus—chemical, psychological, etc.	851 33	
Paid for fuel and gas	2,110 69	
Paid for repairs and improvements	3,611 40	
Paid for traveling expenses of Trustees	45 60	
Paid for general supplies	516 58	
Paid for miscellaneous expenses	412 49	
Paid for incidentals—stamps, telegrams, etc.	305 50	
Paid for payroll of gardeners and extra labor on grounds	1,400 50	
Paid for hose, tools, and hardware	94 15	
Paid for repairs and improvements on grounds	73 15	
Paid for general supplies on grounds	42 90	
Paid for blower-pipe, oil, and repairs to engine	133 55	
Total expended		$53,395 42
Balance in Support appropriation		204 77
Balance in Grounds appropriation		5 96
Balance in Repairs appropriation		1,730 32
Balance in Tuition Fund		1,132 51
Total		$56,468 98

ELIZABETH BLASDEL,
Secretary Board of Trustees, State Normal School, San José, for forty-seventh fiscal year.

REPORTS OF PRINCIPAL.

To the Board of Trustees of the State Normal School, at San José:

GENTLEMEN: I respectfully submit the following report of the Normal School in San José for the school year ending June 28, 1895:

STATISTICS FOR THE SCHOOL YEAR 1894-95.

ENROLLMENT.

Senior Class	229
Middle Class	226
Junior Class	220
Total number of pupils enrolled in Normal School	675
Training Department	216
Total enrollment of pupils for the year	891
Number of visiting teachers	15
Highest enrollment during the year	610
Average enrollment	580
Average daily attendance	566
Total number of graduates for the year	156

ADMISSIONS.

Number of new pupils admitted	232
Number of applicants rejected on examination	25
Total number of applicants for admission	257

Of the above, 11 were admitted on examination; 61 by promotion from the Training Department; 75 on Grammar School diplomas; 30 on High School diplomas; 35 on teachers' certificates; 13 on certificates of promotion from the ninth year of city schools, with letters of recommendation; and 7 on credentials from other institutions.

COUNTY REPRESENTATION IN NORMAL DEPARTMENT.

Alameda, 36.
Amador, 5.
Butte, 1.
Calaveras, 5.
Colusa, 1.
Contra Costa, 21.
El Dorado, 3.
Fresno, 15.
Glenn, 1.
Humboldt, 25.
Kern, 2.
Kings, 2.
Lake, 1.
Los Angeles, 1.
Madera, 4.
Marin, 6.
Mariposa, 2.
Mendocino, 19.
Merced, 5.
Mono, 1.
Monterey, 20.
Napa, 14.
Nevada, 8.
Placer, 16.
Plumas, 2.
Sacramento, 17.
San Benito, 8.
San Bernardino, 1.
San Diego, 1.
San Francisco, 13.
San Joaquin, 14.
San Luis Obispo, 11.
San Mateo, 14.
Santa Barbara, 1.
Santa Clara, 270.
Santa Cruz, 19.
Shasta, 4.
Sierra, 8.
Siskiyou, 5.
Solano, 12.
Sonoma, 14.
Stanislaus, 7.
Sutter, 2.
Tehama, 3.
Trinity, 2.
Tulare, 5.
Tuolumne, 2.
Ventura, 1.
Yolo, 14.
Yuba, 3.

Counties not represented: Alpine, Del Norte, Inyo, Lassen, Modoc, Orange, and Riverside.

NON-RESIDENTS OF CALIFORNIA.

Arizona, 3.	Nevada, 2.	Utah, 1.	Washington, 2.

The work of the school, during the year, has been very satisfactory.

Thanking you for your kind and intelligent interest in the school, I have the honor to subscribe myself,

Very respectfully,

C. W. CHILDS,
Principal.

JUNE 25, 1896.

To the Board of Trustees of the State Normal School, at San José:

GENTLEMEN AND LADY: I have the honor of submitting to you the Thirty-third Annual Catalogue of the State Normal School under your charge.

In April of this year, I submitted a lengthy report, giving a full account of the work of this school from the opening of the term in September, 1895, to the first of April, 1896; it, therefore, is unnecessary to make an extended report at this time.

On the whole, the progress of this school has been satisfactory during the past year. The utmost harmony has prevailed in the Faculty, and in every respect the school is in a much better condition than it was a year ago.

Many needed improvements have been made in our laboratories and considerable apparatus has been purchased. We are now thoroughly prepared to do excellent work in Chemistry, Physics, Manual Training, and Biology.

Financially the school is in excellent condition, as we have a surplus of $1,132 in the Tuition Fund, and a small surplus in each of the other funds.

In January we graduated a class of 62, and we now recommend a class of 104, for graduation to-morrow, June 26, 1896.

According to your request we have raised the standard for admission to this school considerably above that of former years. Reports of excellent work done by the graduates of this school have been received from all parts of the Pacific Coast. We infer from these statements that the work of this Normal School has been satisfactory to parents and school officers.

Thank you for your uniform courtesy and for the assistance rendered in all efforts for the welfare of the school.

Respectfully submitted.

C. W. CHILDS,
Principal.

REPORT OF TRUSTEES

OF

STATE NORMAL SCHOOL,

LOS ANGELES,

FOR THE

TWO YEARS ENDING JUNE 30, 1896.

SACRAMENTO:
A. J. JOHNSTON, : : : : SUPERINTENDENT STATE PRINTING.
1896.

REPORT.

To his Excellency James H. Budd, *Governor of California:*

Sir: We herewith submit, for the State Normal School under our charge, the following financial report for the forty-sixth fiscal year ending June 30, 1895, and for the forty-seventh fiscal year ending June 30, 1896. We also submit a report of the expenditures from the special appropriation of $75,000 for the construction of an addition to the Normal School building. We believe that all these funds have been carefully and judiciously expended, and strict economy exercised in all departments. The new building has been completed and equipped without any deficiency, and the Trustees feel that they have the right to claim that no other building owned by the State has been better constructed, and at less cost, or is better adapted to its purposes than this building.

Since the last report many other improvements have been made. The Chemical building has been erected, laboratories have been newly equipped with apparatus for individual work. The Gymnasium has also received new apparatus. A Sloyd department has been added, both in the Normal and Training departments.

With the enlarged accommodations there has been a marked increase in the number of students applying for admission to the school. Two years ago our students numbered 400. The first term this year opened with 505, and with the class to be admitted in January next, the number will be increased to not less than 550.

An encouraging feature of the outlook is the fact that nearly half of the students who entered last term are either College or High School graduates, or those holding grammar grade certificates. For these, courses are formulated covering from one to three years, instead of a four-year course, thus saving the State the expense of educating them for a longer time.

Two years ago the entering Junior class numbered 150. This term there are only about 100 in that class, consequent on the large number taking advanced work.

The call for thoroughly trained kindergartners has, in accordance with the resolutions passed by the Joint Board of Trustees at San José, induced our Trustees to establish a Kindergarten and Training Department, and there is already a large class in training for this important work.

The Art Department has been greatly strengthened, until now it is one of the most prominent in the State.

There has been advancement all along the line. Harmony has prevailed among the Faculty and students, and the general desire manifest to make this a model Normal School has produced excellent results.

Our graduates are in demand, and are gladly given positions in our country and city schools, and the high standard required for graduation is duly appreciated.

As this portion of the State is rapidly growing in population, and there is every prospect of an increase in the number of students at each term, and the attendance is already very large, there is no way to advance either in numbers or in the equipment or general character of the work without some increase in the appropriation for the next two years. It will be necessary to add to the Faculty, for they are already greatly overworked. To provide for the best work for the State the appropriation for current expenses should not be less than $95,000; for Library, Museum, and apparatus, at least $4,000; for care and improvement of grounds, $2,500; and for moving gymnasium, and improvement of buildings, $5,000. We therefore beg your Excellency so to advise the coming Legislature.

For additional information concerning the work and management of this institution, we respectfully refer you to the catalogue, and to the report of the Principal, herewith submitted.

Respectfully submitted.

A. E. POMEROY,
President Board of Trustees.

FINANCIAL REPORT.

FORTY-SIXTH FISCAL YEAR, ENDING JUNE 30, 1895.

CURRENT EXPENSE FUND.

Date of Auditing.	No. of Voucher		Dr.	Cr.
1894.				
July 1		To balance of appropriation for forty-fifth fiscal year	$1,131 97	
July 1		To appropriation for forty-sixth fiscal year	36,000 00	
July 31	1	By employés, payroll for July		$1,978 33
July 31	2	By Sunset Telephone Co., rent of telephone for July		4 00
Aug. 20	3	By L. A. Transfer Co., freight		4 07
Aug. 20	4	By L. A. City Water Co., water		14 25
Aug. 20	5	By Sunset Telephone Co., telephone service		5 84
Aug. 20	6	By W. H. Perry Lumber Co., lumber		28 56
Aug. 20	7	By Bowen, Edwards & Vance, supplies		47 75
Aug. 20	8	By H. E. Dunn, stamps, express, and labels		7 00
Aug. 20	9	By E. P. Carr, carpenter work		33 12
Aug. 20	10	By L. A. Lighting Co., gas		1 60
Sept. 1	11	By employés, salaries for August		1,978 33
Sept. 1	12	By Frank Swartz, varnishing desks		17 50
Sept. 1	13	By Frank Muchmore, varnishing desks		9 15
Sept. 1	14	By E. P. Carr, repairing		71 55
Sept. 1	15	By Perry Mill and Lumber Co., lumber		249 14
Sept. 1	16	By P. H. Matthews, paint and oil		21 40
Sept. 1	17	By Nauerth & Cass, hardware		7 14
Sept. 1	18	By Kingsley, Barnes & Co., printing		10 75
Sept. 1	19	By L. A. Lighting Co., gas		80
Sept. 1	20	By L. A. City Water Co., water		12 60
Sept. 1	21	By Louis Grubb, moving furniture		2 00
Sept. 1	22	By Barker Bros., chairs		24 00
Sept. 1	23	By Bailey & Schmitz Bros., repairing fur'ture		23 25
Sept. 1	24	By Sunset Telephone Co., telephone service		6 06
Sept. 1	25	By E. D. Bronson, maps and rollers		15 75
Sept. 1	26	By M. A. Hillis, work in cleaning		12 75
Sept. 1	27	By R. B. Marden, work in cleaning		18 00
Sept. 1	28	By Ayers & Lynch, advertising		4 20
Sept. 1	29	By Evening Express, advertising		2 75
Sept. 1	30	By Times-Mirror, advertising		3 60
Sept. 1	31	By E. E. Aldrich, repairing blackboards		68 06
Sept. 1	32	By E. E. Camp, work in cleaning		3 75
Sept. 1	33	By W. B. Hill, work in cleaning		20 25
Sept. 1	34	By H. M. Ferris, work in cleaning		8 75
Oct. 1	35	By employés, salary roll for September		2,241 66
Oct. 6	36	By Leo Alexander & Bro., typewriter ribbon and repairs		1 25
Oct. 6	37	By Walter Hill, assisting janitor		8 25
Oct. 6	38	By Sunset Telephone Co., telephone service		6 76
Oct. 6	39	By F. D. Jones, text-books and supplies		85 60
Oct. 6	40	By B. F. Coulter, toweling and cloth		15 52
Oct. 6	41	By Cass & Smuir Stove Co., pails and cans		12 30
Oct. 6	42	By L. A. City Water Co., water		31 20
Oct. 6	43	By L. A. Lighting Co., gas		2 40
Oct. 6	44	By Blake, Moffitt & Towne, toilet paper		9 00
Oct. 6	45	By P. H. Matthews, paint and oil		18 70
Oct. 6	46	By W. H. Perry Lumber Co., lumber		38 69
Oct. 6	47	By W. P. Fuller & Co., valve oil		4 00
Oct. 6	48	By A. E. Littleboy, combs and brushes		11 90
Oct. 6	49	By Lazarus & Melzer, supplies		26 42
Oct. 6	50	By Nauerth & Cass, hardware		5 28
Oct. 6	51	By S. P. Dysinger, repairing		27 30

Current Expense Fund—Continued.

Date of Auditing.	No. of Voucher		Dr.	Cr.
1894.				
Oct. 6	52	By J. R. Rosvall, cleaning windows		$18 37
Oct. 6	53	By Niles Pease, chairs, mats, etc.		58 78
Oct. 6	54	By Barker Bros., divan		25 00
Oct. 6	55	By Perry Electric Works, electric switch		44 00
Oct. 6	56	By Crescent Coal Co., coal		19 17
Oct. 6	57	By A. Sebelius, making and washing towels		2 85
Oct. 6	58	By Bowen, Edwards & Vance, supplies		2 60
Oct. 6	59	By Edwin Carr, carpenter work		18 55
Oct. 6	60	By W. C. Furry Co., hardware		16 85
Oct. 6	61	By C. F. Vollmer & Co., mugs		2 50
Nov. 1	62	By employés, salaries for October		2,305 00
Nov. 10	63	By J. P. Caldwell, specimen woods		5 00
Nov. 10	64	By Wm. Allen, furniture		34 50
Nov. 10	65	By P. H. Matthews, paint and slating		14 45
Nov. 10	66	By B. F. Coulter, oil cloth and muslin		6 84
Nov. 10	67	By Acme Stationery Co., map		7 50
Nov. 10	68	By P. Hirschfeldt, paper		78 34
Nov. 10	69	By M. Covington, whitewashing		10 00
Nov. 10	70	By Nauerth & Cass, hardware		1 58
Nov. 10	71	By Kingsley, Barnes & Co., paper boxes		11 50
Nov. 10	72	By H. B. Kendrick & Co., matting		3 90
Nov. 10	73	By Paul H. Fitzgerald, painting		45 92
Nov. 10	74	By Meyberg Bros., repairs		5 00
Nov. 10	75	By C. F. Weber & Co., chairs and desks		70 00
Nov. 10	76	By F. D. Jones, class books		14 96
Nov. 10	77	By Leo E. Alexander & Bro., stencil paper		4 05
Nov. 10	78	By L. A. Furniture Co., furniture		330 73
Nov. 10	79	By Blake, Moffitt & Towne, toilet paper		18 00
Nov. 10	80	By A. Flannigan, arithmetics		10 50
Nov. 10	81	By Sanborn & Vail, picture wire and hooks		1 15
Nov. 10	82	By Niles Pease, door mats and matting		93 09
Nov. 10	83	By L. A. Lighting Co., gas and gas stoves		34 90
Nov. 10	84	By A. E. Littleboy, supplies		6 20
Nov. 10	85	By Sunset Telephone Co., telephone service		5 61
Nov. 10	86	By F. W. Braun & Co., chemicals		19 50
Nov. 10	87	By Ad. Frese & Co, supplies		11 90
Nov. 10	88	By Bowen, Edwards & Vance, supplies		6 30
Nov. 10	89	By W. C. Furry Co., gongs		6 50
Nov. 10	90	By L. A. City Water Co., water		55 90
Nov. 10	91	By C. F. Weber & Co., tablet arms		54 00
Nov. 10	92	By W. H. Perry Lumber Co., lumber		26 22
Nov. 10	93	By Lazarus & Melzer, supplies		183 68
Nov. 10	94	By A. Sebelius, washing		2 25
Nov. 10	95	By C. Sebelius, room rent		6 00
Nov. 10	96	By F. B. Dresslar, supplies		2 12
Dec. 4	97	By employés, salaries for November		2,310 00
Dec. 14	98	By F. D. Bronson, maps		92 40
Dec. 14	99	By W. K. Vickery, photographs		22 70
Dec. 14	100	By Crane Company, supplies for engineer		19 61
Dec. 14	101	By E. T. Cook, ink-wells		50
Dec. 14	102	By S. Conradi, clocks		31 00
Dec. 14	103	By Miller & McGrath, papering		24 00
Dec. 14	104	By Th. Bessing, repairs		3 45
Dec. 14	105	By Cerrillos R. R. Coal Co., coal		433 50
Dec. 14	106	By Commercial Printing Co., printing		10 00
Dec. 14	107	By Sign & House Painting Co., painting		82 50
Dec. 14	108	By John McDermott, digging		2 00
Dec. 14	109	By W. C. Furry Co., hardware		10 35
Dec. 14	110	By C. F. Weber & Co., base for reading stand		5 00
Dec. 14	111	By L. A. Lighting Co., gas		15 40
Dec. 14	112	By Sunset Telephone Co., telephone service		6 75
Dec. 14	113	By L. A. City Water Co., water		29 53
Dec. 14	114	By F. D. Jones, dictionaries and class-books		67 23
Dec. 14	115	By Lazarus & Melzer, supplies		31 40
Dec. 14	116	By Nauerth & Cass, hardware		9 03
Dec. 31	117	By employés, salaries for December		2,410 00
1895.				
Jan. 10	118	By P. H. Matthews, paint and oil		6 74
Jan. 10	119	By W. P. Fuller, graphite		1 25
Jan. 10	120	By Leo E. Alexander, typewriter supplies		4 15

CURRENT EXPENSE FUND--Continued.

Date of Auditing.		No. of Voucher		Dr.	Cr.
1895.					
Jan.	10	121	By B. F. Coulter, crash		$6 25
Jan.	10	122	By F. W. Braun, chemicals		1 75
Jan.	10	123	By Lazarus & Melzer, color charts		1 50
Jan.	10	124	By L. A. Sewer Pipe Ass'n, clay		6 00
Jan.	10	125	By West Disinfecting Co., disinfectant		11 40
Jan.	10	126	By Sunset Telephone Co., telephone service		5 65
Jan.	10	127	By L. A. Lighting Co., gas		15 40
Jan.	10	128	By Edw. T. Pierce, salary as Secretary		75 00
Jan.	10	129	By Nauerth & Cass, hardware		10 65
Jan.	10	130	By L. A. City Water Co., water		23 05
Jan.	10	131	By John Rebman, repairs		13 25
Jan.	10	132	By W. H. Perry Lumber Co., lumber		48 64
Jan.	10	133	By employés, salaries for January		2,405 00
Feb.	15	134	By Edw. T. Cook, drawing models		36 00
Feb.	15	135	By Bowen, Edwards & Vance, oil		4 00
Feb.	15	136	By Tufts-Lyon Arms Co., gymnasium supplies		9 00
Feb.	15	137	By Sanborn & Vail, framing views		5 55
Feb.	15	138	By Kingsley, Barnes & Neuner, printing and repairs on books		14 25
Feb.	15	139	By Sunset Telephone Co., telephone service		7 40
Feb.	15	140	By L. A. Lighting Co., gas		14 80
Feb.	15	141	By W. W. Watson, repairs		1 75
Feb.	15	142	By Perry Electric Works, telegraph key and sounder		3 50
Feb.	15	143	By W. K. Vickery, photographs		4 40
Feb.	15	144	By L. A. Water Co., water		34 96
Feb.	15	145	By Ad. Frese & Co., supplies and repairs		5 75
Feb.	15	146	By Perry Electric Works, clock and repairs		221 00
Feb.	15	147	By Thos. Day & Co., gas fixtures		132 50
Feb.	15	148	By E. D. Bronson & Co., maps		34 00
Feb.	15	149	By W. H. Perry Lumber Co., lumber		11 77
Feb.	15	150	By W. C. Furry Co., hardware		11 20
Feb.	15	151	By West Disinfecting Co., disinfectant		14 50
Feb.	15	152	By Nauerth & Cass, hardware		5 25
Feb.	15	153	By F. W. Braun & Co., mercury		7 00
Feb.	15	154	By C. Anderson, labor		20 00
Feb.	15	155	By Morrisson Bros., oil		2 60
Feb.	15	156	By F. B. Dresslar, supplies		9 95
Mar.	4	157	By employés, salaries for February		2,650 00
Mar.	4	158	By Sunset Telephone Co., telephone service		6 92
Mar.	4	159	By Lazarus & Melzer, supplies		10 66
Mar.	4	160	By Nauerth & Cass, hardware and tools		389 41
Mar.	4	161	By L. A. Lighting Co., gas		17 80
Mar.	4	162	By Commercial Printing Co., printing		21 75
Mar.	4	163	By F. W. Braun & Co., chemicals and supplies		44 38
Mar.	4	164	By P. H. Matthews & Co., paint, oil, and varnish		12 15
Mar.	4	165	By B. F. Coulter, cloth		1 61
Mar.	4	166	By Haskel & Shurley, cleaning flues		19 50
Mar.	4	167	By W. C. Furry Co., wire		1 05
Mar.	4	168	By W. Burch, work		17 50
Mar.	4	169	By Jones Book and Printing Co., printing		10 00
Mar.	4	170	By C. Anderson, work		35 00
Mar.	4	171	By W. H. Perry Lumber Co., lumber		134 31
Mar.	4	172	By Leo E. Alexander & Co., mimeograph paper		2 43
Mar.	4	173	By Bowen, Edwards & Vance, oil and blacking		4 20
Mar.	4	174	By Ada M. Laughlin, drawing supplies		24 80
Mar.	4	175	By Parker & Co., repairs		43 18
Mar.	4	176	By L. A. City Water Co., water		38 15
Mar.	4	177	By Thos. Day & Co., gas pendants		20 00
April	1	178	By employés, salaries for March		2,690 00
April	25	179	By Cerrillos R. R. Coal Co., coal		85 00
April	25	180	By Blake, Moffitt & Towne, toilet paper		9 00
April	25	181	By Nauerth & Cass, drawing instruments and hardware		34 70
April	25	182	By Hulse, Bradford & Co., perforated seats		1 20
April	25	183	By Perry Lumber Co., lumber		37 50
April	25	184	By F. W. Braun & Co., chemicals		25 66
April	25	185	By Lazarus & Melzer, supplies		4 14

CURRENT EXPENSE FUND—Continued.

Date of Auditing.	No. of Voucher		Dr.	Cr.
1895.				
April 25	186	By W. C. Furry Co., supplies		$8 50
April 25	187	By Bowen, Edwards & Vance, supplies		1 45
April 25	188	By Leo E. Alexander, mimeograph supplies		14 40
April 25	189	By P. P. Bonham, repairs		4 00
April 25	190	By L. A. Lighting Co., gas		19 40
April 25	191	By L. A. City Water Co., water		35 50
April 25	192	By Sunset Telephone Co., telephone service		1 94
April 25	193	By Com'cial Printing Co., paper and printing		10 50
April 25	194	By F. M. Parker & Co., repairs		10 75
April 25	195	By Ad. Frese, scalpels and repairs		12 80
April 25	196	By Niles Pease, window shades and stools		43 80
April 25	197	By Barker Bros., matting		67 80
April 25	198	By employés, salaries for April		2,690 00
May 8	199	By Nauerth & Cass, hardware		6 30
May 8	200	By Crystal Ice Co., ice		2 81
May 8	201	By F. W. Braun & Co., chemicals		57 30
May 8	202	By E. T. Pierce, cash for stamps		10 00
May 8	203	By Lazarus & Melzer, supplies		91 33
May 8	204	By P. H. Matthews, paint and varnish		3 35
May 8	205	By Z. L. Parmelee, crockery		8 55
May 8	206	By W. K. Vickery, photographs		10 25
May 8	207	By L. A. City Water Co., water		31 34
May 8	208	By L. A. Lighting Co., gas		16 20
May 8	209	By E. T. Pierce, traveling expenses		10 80
May 8	210	By F. A. Molyneaux, traveling expenses		114 80
May 8	211	By T. P. Lukens, traveling expenses		110 20
May 8	212	By A. S. Davidson, traveling expenses		120 20
May 8	213	By A. E. Pomeroy, traveling expenses		108 20
May 8	214	By Mrs. E. A. Marchand, photographs		22 50
May 8	215	By Normal Exponent, printing directory		15 00
May 8	216	By F. D. Jones, natural history charts		30 00
June 1	217	By employés, salaries for May		2,690 00
June 5	218	(Not allowed.)		
June 5	219	By Nauerth & Cass, hardware		5 65
June 5	220	By W. C. Furry Co., sash, rope, and lock		2 85
June 5	221	By F. B. Dresslar, expressage		13 75
June 5	222	By S. P. Monks, botany specimens		5 00
June 5	223	By Leo E. Alexander, mimeograph and supplies		50 15
June 5	224	By Kingsley, Barnes & Neuner, indexes and blanks		4 50
June 5	225	By W. H. Perry Lumber Co., lumber		134 71
June 5	226	By L. A. City Water Co., water		24 76
June 5	227	By Lazarus & Melzer, supplies		4 40
June 5	228	By F. W. Braun & Co., chemicals and medicines		76 58
June 5	229	By Ad. Frese, supplies for biological work		5 50
June 5	230	By Cerrillos R R. Coal Co., coal		85 00
June 5	231	By Blanchard & Fitzgerald, metronome		3 75
June 5	232	By Thomas Day & Co., gas jets		11 00
June 5	233	By Bowen, Edwards & Vance, soap		3 20
June 5	234	By L. O. Merrill, work		15 00
June 5	235	By L. A. Lighting Co., gas		13 20
June 5	236	By Blake, Moffitt & Towne, paper		36 40
June 5	237	By E. D. Bronson, dictionaries		84 00
June 5	238	By E. T. Pierce, postage stamps		25 00
June 5	239	By F. M. Parker & Co., repairs		6 55
July 2	240	By employés, salaries for June		2,810 00
July 2	241	By Nauerth & Cass, supplies and tinning		130 78
July 2	242	By John Quinlan, painting gymnasium		135 00
July 2	243	By Stephens & Armstrong, tank and oil burners		428 00
July 2	244	By John Rockwood, engrossing diplomas		23 10
July 2	245	By Bosqui Engraving Co., diplomas		103 75
July 2	246	By Blanchard & Fitzgerald, care of pianos		15 00
July 2	247	By Kingsley, Barnes & Neuner, printing		14 75
July 2	248	By F. W. Braun & Co., chemicals		11 46
July 2	249	By A. J. Gregory, drawing models		18 00
July 2	250	By Ada M. Laughlin, drawing models		10 31

CURRENT EXPENSE FUND—Continued.

Date of Auditing.	No. of Voucher		Dr.	Cr.
1895.				
July 2	251	By Lazarus & Melzer, supplies		$63 82
July 2	252	By Louise M. Harvey, lectures on hygiene		30 00
July 2	253	By L. A. City Water Co., water		28 35
July 2	254	By L. A. Lighting Co., gas		22 00
July 2	255	By E. T. Pierce, salary as Secretary of Board		75 00
		By balance		43
		Totals	$37,131 97	$37,131 97

CARE AND IMPROVEMENT OF GROUNDS, LIBRARY, AND MUSEUM, AND PURCHASE OF SCIENTIFIC APPARATUS.

Date of Auditing.	No. of Voucher		Dr.	Cr.
1894.				
July 1		To balance of appropriation from forty-fifth fiscal year	$919 14	
July 1		To appropriation from forty-sixth fiscal year	2,500 00	
Aug. 20	1	By Wm. Kapple, salary for July		$50 00
Aug. 20	2	By Thomas Farnham, work on grounds		9 75
Aug. 20	3	By O. J. Muchmore, cash paid for work on grounds		3 00
Aug. 20	4	By Kingsley, Barnes & Neuner, rebinding books		54 50
Sept. 14	5	By Thos. Farnham, salary for August		60 00
Sept. 14	6	By Kingsley, Barnes & Neuner, repairing books		1 30
Sept. 14	7	By A. L. Eves, work on grounds		11 25
Sept. 14	8	By E. D. Bronson, books		8 50
Sept. 14	9	By F. M. Parker & Co., sewer-pipe		15 60
Oct. 6	10	By Thos. Farnham, salary for September		60 00
Oct. 6	11	By F. D. Jones, library books		445 00
Oct. 6	12	By L. B. Cohn, stop-watch		8 00
Oct. 6	13	By cement walk		59 40
Nov. 10	14	By Wm. L. Riley, grading		199 49
Nov. 10	15	By F. D. Jones, books		19 61
Nov. 10	16	By Thos. Farnham, salary for October		60 00
Nov. 10	17	By L. A. Transfer Co., freight on apparatus		42 78
Nov. 10	18	By Wm. Taylor, work on grounds		30 82
Nov. 10	19	By Edw. T. Pierce, cash paid for work on grounds		15 00
Nov. 10	20	By E. E. Peck, apparatus		6 60
Nov. 10	21	By Eimer & Amand, physical apparatus		341 84
Dec. 14	22	By Ad. Frese, microscope		14 00
Dec. 14	23	By Cal. Portland Cement Co., cement		10 40
Dec. 14	24	By Wm. L. Riley, work on grounds		21 00
Dec. 14	25	By Wm. Taylor, work on grounds		23 25
Dec. 14	26	By Meyberg Bros., making apparatus		10 25
Dec. 14	27	By Thos. Farnham, salary for November		60 00
1895.				
Jan. 10	28	By Thos. Farnham, salary for December		60 00
Jan. 10	29	By E. D. Bronson, Standard dictionary		8 50
Jan. 10	30	By F. M. Parker, sewer-pipe		12 10
Jan. 10	31	By Wm. Riley, work with team		21 00
Jan. 10	32	By M. La Pointe, repairing tools		2 15
Jan. 10	33	By Johnson & Emigh, periodicals		75 25
Jan. 10	34	By F. D. Jones, books		19 89
Feb. 15	35	By Meyberg Bros., repairing apparatus		5 00
Feb. 15	36	By F. D. Jones, periodicals		7 00
Feb. 15	37	By Lazarus & Melzer, books		12 24
Feb. 15	38	By C. M. Loberanes, repairing apparatus		4 50
Feb. 15	39	By D. Appleton & Co., books		10 00
Feb. 15	40	By Wm. Taylor, periodicals		8 25
Feb. 15	41	By Thos. Farnham, salary for January		60 00
Mar. 4	42	By S. D. Sturgess, books		55 00

CARE AND IMPROVEMENT OF GROUNDS, LIBRARY, ETC.—Continued.

Date of Auditing.	No. of Voucher		Dr.	Cr.
1895.				
Mar. 4	43	By Oriental Nursery, work on grounds		$7 50
Mar. 4	44	By Dodd, Mead & Co., books		35 00
Mar. 4	45	By F. S. Collins, one chymograph		5 00
Mar. 4	46	By F. D. Jones, plants		36 67
Mar. 4	47	By Thos. Farnham, salary for February		60 00
April 25	48	By Andrews Robinson, sea mosses		10 50
April 25	49	By Kingsley, Barnes & Neuner, books		8 95
April 25	50	By P. P. Bonham, salary for February		11 70
April 25	51	By Pacific Optical Co., work on grounds		30 87
April 25	52	By Thos. Farnham, salary for March		60 00
April 25	53	By Thos. Farnham, salary for April		60 00
April 25	54	By F. D. Jones, books		74 84
April 25	55	By W. L. Riley, work on grounds and fence		57 12
April 25	56	By Thos. Farnham, salary as gardener for May		60 00
April 25	57	By F. D. Jones, books		821 01
April 25	58	By Thos. Farnham, salary as gardener for June		60 00
April 25	59	By Nauerth & Cass, lawn-mower		5 00
		By balance		12 76
		Totals	$3,419 14	$3,419 14

PETTY CASH FUND.

Date of Auditing.	No. of Voucher		Dr.	Cr.
1894.				
July 1		To balance of account for forty-fifth fiscal year	$222 20	
July 15		To F. A. Molyneaux, refunding overpayment of mileage	80	
Oct. 18		To Pomona Athletic Club, parallel bars	15 00	
Oct. 30	1	By petty small bills, as per Voucher 1		$29 11
Dec. 30	2	By petty small bills, as per Voucher 2		13 55
1895.				
Jan. 11		To C. Johnston, loss of chorus book	70	
Feb. 1	3	By petty cash bills, as per Voucher 3		16 96
Mar. 1	4	By petty cash bills, as per Voucher 4		12 62
April 1	5	By petty cash bills, as per Voucher 5		15 94
May 1	6	By petty cash bills, as per Voucher 6		1 90
June 1	7	By petty cash bills, as per Voucher 7		7 29
June 30	8	By petty cash bills, as per Voucher 8		35 14
June 30	9	By J. W. Anderson, salary as Secretary of Joint Board		20 00
June 30	10	By L. A. Lithographic Co., lithographs and letterheads		69 00
June 30		By balance		27 19
		Totals	$248 70	$248 70

FORTY-SEVENTH FISCAL YEAR, ENDING JUNE 30, 1896.

CURRENT EXPENSE FUND.

Date of Auditing.	No. of Voucher		Dr.	Cr.
1895.				
July 1		To amount of appropriation for forty-seventh fiscal year	$40,000 00	
Aug. 1	1	By employés, salaries for July, 1895		$2,875 00
Aug. 14	2	By L. A. City Water Co., water		8 55
Aug. 14	3	By T. Bessing, repairs in gymnasium		11 85
Aug. 14	4	By L. A. Lighting Co., gas		2 47
Aug. 14	5	By Walker, Rust & Hunt, oil		15 86
Aug. 14	6	By W. P. Fuller & Co., glass		5 60
Aug. 14	7	By P. H. Matthews, varnish and oil		12 30
Aug. 14	8	By W. H. Perry Lumber Co., lumber		62 37
Aug. 14	9	By Lazarus & Melzer, index		1 35
Aug. 14	10	By Nauerth & Cass, hardware		11 23
Aug. 14	11	By Kingsley, Barnes & Neuner, envelopes		12 00
Aug. 14	12	By Maeder & Priester, mouse-traps and br'shes		2 00
Sept. 2	13	By employés, salaries for August		2,785 00
Sept. 21	14	By L. A. Lighting Co., gas		1 15
Sept. 21	15	By P. H. Matthews, paint and oil		16 10
Sept. 21	16	By L. A. City Water Co., water		8 12
Sept. 21	17	By Evening Express, advertising		2 80
Sept. 21	18	By L. A. Times, advertising		4 30
Sept. 21	19	By L. A. Herald, advertising		4 00
Sept. 21	20	By Nauerth & Cass, plumbing and supplies		70 36
Sept. 21	21	By C. F. Weber & Co., maps allowed from another fund 70-40		
Sept. 21	22	By Blanche Putnam, copying		5 50
Sept. 21	23	By Lazarus & Melzer, supplies		3 56
Sept. 21	24	By Kingsley, Barnes & Neuner, printing		4 50
Sept. 21	25	By W. P. Fuller & Co., glass		5 10
Sept. 21	26	By W. H. Perry Lumber Co., lumber		48 17
Sept. 21	27	By Niles Pease, shades and repairs		34 70
Oct. 1	27*	By employés, salaries for September		2,905 00
Oct. 15	28	By Nauerth & Cass, hardware and supplies		46 47
Oct. 15	29	By Kingsley, Barnes & Neuner, printing and repairs		78 80
Oct. 15	30	By L. A. Rubber Stamp Co., rubber stamps		9 25
Oct. 15	31	By Blake, Moffitt & Towne, toilet paper		9 00
Oct. 15	32	By H. Jevne, janitor supplies		72 85
Oct. 15	33	By W. H. Perry Lumber Co., lumber		8 35
Oct. 15	34	By F. M. Parker & Co., repairs		16 02
Oct. 15	35	By Coulter Dry Goods Co., oil cloth		1 80
Oct. 15	36	By W. P. Fuller & Co., glass		3 35
Oct. 15	37	By Lazarus & Melzer, supplies		30 34
Oct. 15	38	By F. W. Braun & Co., sponges and chamois		3 40
Oct. 15	39	By F. D. Jones, text-books		11 30
Oct. 15	40	By L. A. Lighting Co., gas		11 20
Oct. 15	41	By L. A. City Water Co., water		26 55
Oct. 15	42	By Prang Educational Co., drawing supplies		65 73
Nov. 1	43	By employés, salaries for October, 1895		2,905 00
Nov. 20	44	By Public School Pub. Co., method books		6 72
Nov. 20	45	By W. P. Fuller & Co., glass and putty		6 38
Nov. 20	46	By Hulse, Bradford & Co., oil cloth		2 67
Nov. 20	47	By Payot, Upham & Co., supplementary readers		22 68
Nov. 20	48	By Nauerth & Cass, hardware		5 65
Nov. 20	49	By Lazarus & Melzer, supplies		37 40
Nov. 20	50	By F. S. Collins, botany specimens		5 00
Nov. 20	51	By Blanche Putnam, typewriting		7 00
Nov. 20	52	By L. A. Lithographic Co., letterheads		6 50
Nov. 20	53	By Harper & Reynolds, globe valves and tools		52 17
Nov. 20	54	By P. H. Matthews, paint and varnish		5 20
Nov. 20	55	By O. W. Tilden, work on roof		1 75
Nov. 20	56	By Frank H. Howe, work on steam pipe		7 50
Nov. 20	57	By W. H. Dutton, covering steam pipes		59 11
Nov. 20	58	By L. A. Lighting Co., gas		15 01
Nov. 20	59	By S. Nordlinger, repairing clock		2 50

CURRENT EXPENSE FUND—Continued.

Date of Auditing.	No. of Voucher		Dr.	Cr.
1895.				
Nov. 20	60	By L. A. City Water Co., water		$39 75
Nov. 20	61	By Normal Exponent, directory		5 00
Nov. 20	62	By United Oil Producers, petroleum		25 00
Nov. 20	63	By H. Jevne, sapolio		5 25
Nov. 20	64	By Perry Electric Works, repairs		10 00
Nov. 20	65	By Sanborn, Vail & Co., modeling clay		26 00
Nov. 30	66	By employés, salaries for November, 1895		2,905 00
Dec. 17	67	By L. A. Lighting Co., gas		16 95
Dec. 17	68	By Ed. T. Pierce, cash for postage		10 50
Dec. 17	69	By Nauerth & Cass, hardware supplies		4 83
Dec. 17	70	By Kingsley, Barnes & Neuner, printing		7 50
Dec. 17	71	By Lazarus & Melzer, supplies		7 15
Dec. 17	72	By W. W. Watson, repairs on stoves		3 40
Dec. 17	73	By A. A. Bailey, packing for engine		2 64
Dec. 17	74	By F. W. Braun & Co., chemicals		3 00
Dec. 17	75	By Blanchard & Fitzgerald, metronome		3 75
Dec. 17	76	By Normal Exponent, page directory		5 00
Dec. 17	77	By L. A. City Water Co., water		34 65
Dec. 17	78	By Cerrillos R. R. Coal Co., coal		85 00
1896.				
Jan. 10	79	By employés, salaries for December, 1895		2,905 00
Jan. 15	80	By Cass & Smuir Stove Co., stoves and hardware		53 50
Jan. 15	81	By Nauerth & Cass, gasoline furnace and hardware		17 25
Jan. 15	82	By Lazarus & Melzer, supplies		9 14
Jan. 15	83	By L. A. City Water Co., water		33 60
Jan. 15	84	By L. A. Lighting Co., gas		13 85
Jan. 15	85	By Kingsley, Barnes & Neuner, printing and cardboard		5 85
Jan. 15	86	By Mrs. J. H. Brock, repairing blackboards		34 50
Jan. 15	87	By Wm. S. Allen, blacking cases		6 00
Jan. 15	88	By W. M. Osborn, repairs		4 50
Jan. 15	89	By Normal Exponent, page directory		5 00
Jan. 15	90	By L. A. Rubber Stamp Co., rubber stamps		2 50
Jan. 15	91	By P. H. Matthews, supplies		3 85
Jan. 15	92	By H. Jevne, coal oil		11 25
Jan. 15	93	By F. W. Braun & Co., toilet paper and chem.		55 14
Jan. 15	94	By W. W. Watson, repairs and fire shovels		4 80
Jan. 15	95	By Ed. T. Cook, music books		21 00
Jan. 15	96	By E. T. Pierce, salary as Secretary of Board		75 00
Jan. 15	97	By W. H. Perry Lumber Co., lumber		43 64
Feb. 1	98	By employés, salaries for January, 1896		2,907 50
Feb. 12	99	By Johnson & Emigh, periodicals		55 00
Feb. 12	100	By May and Minnie Egan, petroleum		27 50
Feb. 12	101	By Howe Bros., card receivers		4 50
Feb. 12	102	By L. A. City Water Co., water		37 05
Feb. 12	103	By L. A. Lighting Co., gas		16 00
Feb. 12	104	By E. T. Pierce, cash for postage		10 00
Feb. 12	105	By F. W. Braun & Co., chemicals		14 80
Feb. 12	106	By W. P. Fuller & Co., glass and putty		18 40
Feb. 12	107	By Lazarus & Melzer, supplies		27 91
Feb. 12	108	By Nauerth & Cass, lock		30
Feb. 12	109	By Niles Pease, rubber ends		1 80
Feb. 12	110	By A. B. Chapman, molding pans		13 20
Feb. 12	111	By Normal Exponent, page directory		5 00
Feb. 12	112	By Public School Pub. Co., supplementary books		4 00
Feb. 12	113	By Geo. R. Meyers, brick work		16 00
Feb. 12	114	By W. H. Perry Lumber Co., lumber		15 80
Feb. 12	115	By H. C. Licktenberger, mounting photos		6 80
Mar. 1	116	By employés, salaries for February, 1896		2,907 50
Mar. 16	117	By Ginn & Co., music		8 90
Mar. 16	118	By W. C. Furry Co., supplies		7 35
Mar. 16	119	By L. A. Lighting Co., gas		9 12
Mar. 16	120	By L. A. City Water Co., water		33 45
Mar. 16	121	By Stemple Fire Ex. Co., fire extinguishers		45 00
Mar. 16	122	By F. D. Jones, text-books		13 17
Mar. 16	123	By Nauerth & Cass, hardware		4 40

Current Expense Fund—Continued.

Date of Auditing.	No. of Voucher		Dr.	Cr.
1896.				
Mar. 16	124	By W. H. Hoegee, flags		$24 50
Mar. 16	125	By Normal Exponent, page directory		5 00
Mar. 16	126	By W. W. Watson, stove pipe		2 70
Mar. 16	127	By Lazarus & Melzer, supplies		1 55
Mar. 16	128	By F. W. Braun & Co., chemicals		14 75
Mar. 16	129	By Kingsley Barnes & Neuner, repairs on books		6 05
Mar. 16	130	By Harper & Reynolds, supplies		1 60
April 1	131	By employés, salaries for March		2,907 50
April 27	132	By Lazarus & Melzer, supplies		4 81
April 27	133	By L. A. City Water Co., water		35 55
April 27	134	By W. H. Perry Lumber Co., lumber		16 95
April 27	135	By Prang Educational Co., supplies		10 70
April 27	136	By W. H. Hoegee, flag		8 00
April 27	137	By L. A. Lighting Co., gas		19 55
April 27	138	By Normal Exponent, page directory		5 00
April 27	139	By Union Hardware Co., shears		16 00
April 27	140	By Nauerth & Cass, hardware		3 56
April 27	141	By Jones Book Store, old periodicals		2 10
April 27	142	By Niles Pease, shades and matting		9 95
April 27	143	By F. W. Braun & Co., chemicals		10 55
May 1	144	By employés, salaries for April		2,907 50
May 5	145	By F. A. Molyneaux, mileage to San José		103 00
May 5	146	By T. P. Lukens, mileage to San José		98 20
May 5	147	By A. S. Davidson, mileage to San José		108 60
May 5	148	By E. T. Pierce, expenses to San José		45 35
May 5	149	By H. Jevne, dusters and brushes		15 50
May 5	150	By A. B. Simons, copying		5 00
May 5	151	By E. T. Cook, music charts		16 50
May 5	152	By Normal Exponent, page directory		5 00
May 5	153	By Egan Sisters, petroleum		35 25
May 5	154	By Campbell's Curio Store, objects for drawing		8 45
May 5	155	By Ada M. Laughlin, drawing material		13 10
May 5	156	By F. W. Braun & Co., chemicals		54 37
May 5	157	By Lazarus & Melzer, supplies		14 40
May 5	158	By Nauerth & Cass, hardware supplies		8 10
May 5	159	By Kingsley, Barnes & Neuner, printing		1 00
May 5	160	By Coulter's Dry Goods Store, dusting cloth		3 02
May 5	161	By L. A. Lighting Co., gas		10 85
May 5	162	By L. A. City Water Co., water		47 25
May 5	163	By L. A. Transfer Co., freight and cartage		15 81
May 5	164	By W. H. Perry Lumber Co., lumber		3 87
May 5	165	By P. H. Matthews, shellac and oil		4 30
May 5	166	By Boston Dry Goods Store, silesia and needl's		4 50
June 1	167	By employés, salaries for May		2,907 50
June 5	168	By Queen & Co., supplies for Chemical Lab.		159 23
June 5	169	By L. A. City Water Co., water		50 25
June 5	170	By L. A. Lighting Co., gas		15 85
June 5	171	By Blanche Putnam, copying		2 50
June 5	172	By Z. L. Parmelee, glassware		5 40
June 5	173	By Kingsley, Barnes & Neuner, printing		9 00
June 5	174	By Jones Book Store, supplies		3 30
June 5	175	By Niles Pease, shades		1 95
June 5	176	By Lazarus & Melzer, blank books		1 50
June 5	177	By F. W. Braun & Co., chemicals		10 60
June 5	178	By Normal Exponent, directory for May		5 00
June 5	179	By Coulter's Dry Goods Store, cloth		1 00
June 5	180	By W. P. Fuller & Co., glass		15 00
June 5	181	By Union Photo-Eng. Co., half-tones for catalogues		20 90
July 1	182	By employés, salaries for June, 1896 (salary of Secretary for six months, $75)		2,982 50
July 8	183	By L. A. City Water Co., water		48 60
July 8	184	By F. W. Braun & Co., chemicals		6 05
July 8	185	By L. A. Lighting Co., gas		16 72
July 8	186	By Lazarus & Melzer, supplies		6 28
July 8	187	By Blanchard & Fitzgerald, care of pianos		15 00
July 8	188	By Boston Dry Goods Store, ribbon		3 77
July 8	189	By H. Jevne, coal oil and soap		4 25

CURRENT EXPENSE FUND—Continued.

Date of Auditing.	No. of Voucher		Dr.	Cr.
1896.				
July 8	190	By Nauerth & Cass, hardware for repairs		$12 04
July 8	191	By Kingsley, Barnes & Neuner, printing		2 50
July 8	192	By E. T. Pierce, cash for stamps		10 00
July 8	193	By John Rockwood, engrossing diplomas		24 60
July 8	194	By Normal Exponent, page directory		5 00
July 8	195	By L. A. Lithographic Co., diplomas		34 20
July 8	196	By W. H. Perry Lumber Co., lumber		34 17
July 8	197	By F. S. Collins, botany specimens		5 00
July 8	198	By Lane, Birely Co., printing		13 00
July 8	199	By B. F. Coulter Co., ribbon		5 50
		By balance		1,658 77
		Totals	$40,000 00	$40,000 00

CARE AND IMPROVEMENT OF GROUNDS.

Date of Auditing.	No. of Voucher		Dr.	Cr.
1895.				
July 1		To appropriation for forty-seventh fiscal year	$1,500 00	
Aug. 14	1	By Thos. Farnham, salary as gardener, July		$60 00
Aug. 14	2	By L. A. City Water Co., water		10 05
Sept. 21	3	By W. H. Perry Lumber Co., lumber		75 71
Sept. 21	4	By L. A. City Water Co., water		5 40
Sept. 21	5	By Thos. Farnham, salary as gardener, Aug.		60 00
Sept. 21	6	By Wesley Hill, work on grounds		9 75
Oct. 15	7	By L. A. City Water Co., water		6 00
Oct. 15	8	By Ward Bros., cement work		50 00
Oct. 15	9	By Thos. Farnham, salary for gardener, Sept.		60 00
Nov. 20	10	By D.E Harnden, rocks for gutters, and work		26 00
Nov. 20	11	By L. A. City Water Co., water		4 35
Nov. 20	12	By Geo. R. Meyers, brick and cement work		27 00
Nov. 20	13	By Gray Bros. & Ward, cement walks		21 40
Nov. 20	14	By W. P. Fuller & Co., cement		3 80
Nov. 20	15	By Thos. Farnham, salary for October		60 00
Dec. 17	16	By L. A. City Water Co., water		5 70
Dec. 17	17	By Thos. Farnham, salary for November		60 00
1896.				
Jan. 15	18	By L. A. City Water Co., water		3 15
Jan. 15	19	By J. Q. Ayres, fence		101 20
Jan. 15	20	By Nauerth & Cass, water-pipe		12 85
Jan. 15	21	By Thos. Farnham, salary for December		60 00
Feb. 12	22	By L. A. City Water Co., water		3 15
Feb. 12	23	By D. E. Harnden, work with team		10 50
Feb. 12	24	By Thos. Farnham, salary for January		60 00
Mar. 16	25	By L. A. City Water Co., water		1 80
Mar. 16	26	By Thos. Farnham, salary for February		60 00
Mar. 16	27	By D. E. Harnden, work with team		12 25
Mar. 16	28	By W. L. Riley, grading		50 75
April 27	29	By W. W. Watson, repairs and tools		5 10
April 27	30	By W. L. Riley, work and rock		10 16
April 27	31	By F. M. Parker, sewer-pipe and work		82 80
April 27	32	By Thos. Farnham, salary for March		60 00
April 27	33	By L. A. City Water Co., water		75
May 5	34	By Thos. Farnham, salary for April		60 00
May 5	35	By Nauerth & Cass, garden supplies		8 10
May 5	36	By L. A. City Water Co., water		5 40
June 5	37	By Germain Fruit Co., blue grass seed		1 50
June 5	38	By L. A. City Water Co., water		7 50
June 5	39	By Cass & Smuir Stove Co., hose		7 50
June 5	40	By Thos. Farnham, salary as gardener, May		60 00
July 8	41	By L. A. City Water Co., water		4 65
July 8	42	By Nauerth & Cass, garden supplies		1 62
July 8	43	By Thos. Farnham, salary for June		60 00
		By balance		204 11
		Totals	$1,500 00	$1,500 00

FURNITURE AND APPARATUS.

Date of Auditing.	No. of Voucher		Dr.	Cr.
1895.		To amount of appropriation	$5,000 00	
July 2	1	By Niles Pease, furniture		$243 20
July 2	2	By Eimer & Amend, apparatus		220 59
Sept. 21	3	By C. F. Weber & Co., chairs		240 00
Sept. 21	4	By Central School Supply Co., relief maps		100 00
Oct. 15	5	By Adolph Frese, microscopes and supplies		40 50
Oct. 15	6	By Ed. T. Pierce, cash for freight on apparatus		10 10
Oct. 15	*6	By C. T. Weber & Co., maps		70 40
Nov. 20	7	By L. T. Clemens, batteries		5 40
Nov. 20	8	By Barker Bros., furniture		69 50
Nov. 20	9	By E. T. Pierce, cash for freight		13 10
Dec. 17	10	By Niles Pease, furniture		189 75
1896.				
Feb. 12	11	By Alexander & Beyrl, laboratory tables		278 00
Feb. 12	12	By P. H. Matthews, paint and varnish		7 70
Feb. 12	13	By Nauerth & Cass, plumbing		132 00
Feb. 12	14	By A. L. Robbins & Co., apparatus		959 51
Mar. 16	15	By Nauerth & Cass, hardware and plumbing		42 24
Mar. 16	16	By Niles Pease, furniture		33 00
Mar. 16	17	By W. H. Perry Lumber Co., lumber		15 70
April 27	18	By Arthur S. Hill, dissection cases		10 50
April 27	19	By John Taylor & Co., chemical apparatus		16 95
May 5	20	By Nauerth & Cass, plumbing		23 34
May 5	21	By A. S. C. Blake, phys. training apparatus		58 00
June 5	22	By Queen & Co., chemical apparatus		401 46
July 1	--------	By balance		1,819 16
		Totals	$5.000 00	$5,000 00

PETTY CASH FUND.

Date of Auditing.	No. of Voucher		Dr.	Cr.
1895.				
July 1	--------	To balance for forty-sixth fiscal year	$27 19	
July 1	--------	To chemistry fees	252 00	
Aug. 1	11	By petty small bills, as per Voucher 11		$2 10
Aug. 3	12	By Union Photo-Engraving Co., cuts		36 00
Aug. 4	13	By E. S. Webster, ladder		7 00
Sept. 27	--------	To Library dues	2 45	
Sept. 21	14	By Z. L. Parmelee, crockery		17 50
Sept. 21	15	By petty small bills, as per Voucher 15		16 90
Oct. 1	16	By petty small bills, as per Voucher 16		6 25
Nov. 18	--------	To cash received from old books	3 65	
Oct. 1	17	By C. E. Day, rent for Tabernacle		5 00
Oct. 29	18	By Post Office, stamps		5 00
1896.				
Jan. 1	19	By petty small bills, as per Voucher 19		1 69
Feb. 1	20	By petty small bills, as per Voucher 20		7 60
Feb. 24	21	By J. R. Putnam, photographs		15 00
Feb. 24	22	By Pomona Athletic Association, parallel bars		15 00
Feb. 24	--------	To L. A. County, rent of hall	12 00	
Mar. 1	23	By petty small bills, as per Voucher 23		3 00
April 1	24	By petty small bills, as per Voucher 24		6 90
April 18	--------	To S. C. T. A., rent of hall	12 00	
May 1	25	By cash paid for expressage		11 10
June 1	--------	To cash from sale of old books	3 95	
June 1	--------	To expressage deducted from Voucher 163	1 23	
June 1	26	By petty small bills, as per Voucher 26		8 95
June 30	27	By petty small bills, as per Voucher 27		23 92
		By balance		125 56
		Totals	$314 47	$314 47

BUILDING FUND.

Date of Auditing.	No. of Voucher		Dr.	Cr.
1894.				
July 1		To balance, as per last report	$52,048 81	
July 15	*34	By Aug. Wiffenbach, 3d paym't on tin and galvanized iron work		$723 00
July 15	35	By Mackay & Young, 4th paym't on iron and brick work		6,270 00
July 17	36	By P. P. Bonham, 1st paym't on plumbing		1,000 00
July 17	37	By O. H. Muchmore, salary as Supt. for June		200 00
July 17	38	By Wieben & Drumold, raised letter sign		35 00
July 17	39	By P. P. Bonham, 2d paym't on plumbing		2,500 00
July 17	40	By O. H. Muchmore, cash paid watchman		17 42
July 17	41	By P. P. Bonham, 3d paym't on plumbing		3,000 00
July 17	42	By John Rebman, 5th paym't on carpenter work		4,000 00
July 18	43	By Perry Electric Works, extra electric wiring		64 00
July 21	44	By Paul Fitzgerald, 1st paym't on painting		300 00
July 22	45	By Paul Fitzgerald, 2d paym't on painting		500 00
July 25	46	By Preston & Locke, 4th paym't on plans and specifications		220 18
Aug. 20	47	By O. J. Muchmore, salary as Supt. for July		200 00
Aug. 20	48	By O. J. Muchmore, cash paid watchman		12 57
Aug. 20	49	By Paul Fitzgerald, 3d paym't on painting		600 00
Aug. 23	50	By Mackay & Young, 5th paym't on brick and iron work		5,425 00
Sept. 14	51	By O. J. Muchmore, salary as Supt. for Aug.		200 00
Sept. 14	52	By O. J. Muchmore, cash paid for ladder		2 50
Sept. 14	53	By S. J. Keese, 1st paym't on electric work		226 70
Sept. 14	54	By S. J. Keese, 2d paym't on electric work		210 30
Sept. 14	55	By S. J. Keese, 3d paym't on electric work		93 00
Oct. 6	56	By F. M. Parker, service-pipe		7 51
Oct. 6	57	By Fruhling Bros., window guard bars		38 55
Oct. 6	58	By L. A. Lighting Co., service-pipe		7 35
Oct. 6	59	By L. A. City Water Co., service-pipe		35 00
Oct. 6	60	By O. H. Muchmore, salary as Supt. for Sept.		86 58
Oct. 6	61	By Paul Fitzgerald, 4th paym't on painting		680 00
Oct. 6	62	By Aug. Wiffenbach, 4th paym't on tin and galvanized iron work		642 00
Oct. 6	63	By John Rebman, 6th paym't on carpenter work		4,608 00
Oct. 6	64	By John Rebman, blackboards		640 53
Nov. 1	*64	By C. F. Weber & Co., furniture		3,294 05
Nov. 1	65	By P. P. Bonham, 4th payment on plumbing		3,235 00
Nov. 10	66	By W. H. Perry Lumber Co., work benches		139 50
Nov. 10	67	By L. A. Furniture Co., carpets		111 25
Nov. 10	68	By C. F. Weber & Co., furniture		240 00
Nov. 10	69	By Paul H. Fitzgerald, 5th paym't on painting		694 00
Nov. 10	70	By John Rebman, 7th payment on carpenter work		5,536 00
Nov. 10	71	By P. P. Bonham, 5th payment on plumbing		3,245 00
Nov. 10	72	By John Rebman, extra carpenter work		993 00
Nov. 10	73	By John Rebman, extra plumbing, Chemical Laboratory		367 00
Dec. 31	74	By John Rebman, extra work on building		303 34
Dec. 31	75	By Preston & Locke, architects' fees		50 00
Dec. 31	76	By J. H. Spires, folding chairs		275 00
1895.				
Jan. 9	77	By Mackay & Young, extra work on building		765 06
Jan. 10	78	By P. P. Bonham, extra work on building		234 38
April 25	79	By Niles Pease, office desk		11 50
April 25	80	By Baker Iron Works, bolts and washers		8 92
June 30		To balance	38	
		Totals	$52,049 19	$52,049 19

The fund seems to have been overdrawn to the amount of 38 cents. The above sums, however, were actually paid out by us, for which we hold vouchers.

PRINCIPAL'S REPORT.

To the Boards of the California State Normal Schools, assembled in Joint Session at San José, April 12, 1896:

GENTLEMEN: The past year has been one of the most prosperous and satisfactory in the history of the State Normal School at Los Angeles. Our growth has not been so rapid as to disarrange the plans for the year, and our Faculty, for the first time in many years, has been nearly large enough to do justice to the number of students enrolled.

Because of the examinations for entrance and the consequent power to limit attendance, the school has not greatly increased in size over last year, the relative enrollment being 475 for 1894–95 and 498 for 1895–96.

However, though to outside appearance the tenor of our way has seemed thus "even," we have in reality made several important changes in our equipment, in our Faculty, and in our methods of work.

Our Physical Laboratory has been furnished with apparatus for individual work, each of the ten experiment tables being now supplied with four duplicate sets. This enables all members of the class to study inductively, through experiment. Our Chemical Laboratory has been refitted with new tables, made after the most approved pattern, and these have been equipped with apparatus sufficient for forty students to work individually. Our Psychological Laboratory has also received additions of apparatus. Still more, however, is needed in this important department to make the work as effective as it should be. Our Gymnasium is also better equipped than it was one year ago.

Our work is becoming more departmental and specialized, an improvement heretofore impossible by reason of our small Faculty. With an occasional exception made necessary by the arrangement of the program, each teacher has devoted his or her whole time to one, or at the most to two subjects, thus accomplishing better results than under the old plan in which several of the Faculty scattered their energies in trying to teach various subjects in the same term.

There has also been more coördination. Teachers of allied subjects have held frequent conferences to see how they might best aid one another in their work.

The effect of such specialization and coördination, together with our better equipment, has been to make scholarship more thorough; and I think I can safely say that students acquire as much now, in two years, as they did in three years, before these changes.

But better than all else, the work has grown more professional. Instead of pursuing academic work, solely, for two years, as under the old course, students begin their work in psychology the first term, thus causing them to feel, at the very inception of their course, that they are in a professional school studying for a special purpose.

We feel that we have greatly strengthened the school by raising the standard of admission. No one from the ninth grade is now admitted without examination. Before we had this regulation, many came to us who had finished their course in the public school at the age of fourteen or fifteen, having been graduated on averages, though known to be deficient in one or two subjects. Some came to the Normal without any definite purpose, simply because they could be admitted on their diplomas. Now only the bravest, those with a definite and fixed purpose, decide to come to the Normal School; and from among these we have the power to reject the mentally and physically weak. Fewer students proportionately have dropped their work than during any previous year.

The only exception to the rule requiring students to enter on examination, are those coming from accredited High Schools and those holding teachers' certificates. Of these two classes we have received nearly fifty during the year. They take special courses, covering from one to two and a half years. The course for High School graduates accredited to the State University requires from two to two and a half years. We think that it is within the province of the Joint Board to make some uniform regulation in regard to the time required of these before being granted diplomas. As it is, the time ranges from one year in one school to two and a half in others. We have formulated a very careful report on this question, which I shall he pleased to present if so desired.

For those who hold Grammar Grade certificates, and who have had a successful experience in teaching of two years, we formulate a course covering from one to two years, which, if successfully pursued, will entitle such students to diplomas. Holders of Grammar Grade certificates have in effect life certificates in this State. It is plain, if we can induce such teachers to spend even a year in a Normal School, the State is a gainer thereby.

The harmonious state of affairs during the year, and the successful working out of the plans of the Principal, have been made possible by the earnestness and faithful work of the Faculty.

There has been one addition to the force. Prof. Everett Shepardson, as assistant to Dr. Dresslar, teaches Psychology and Pedagogy, and also directly superintends the work in the Model and Training School. He has given excellent satisfaction. On account of the large proportion of young ladies in the school, it was thought best by the Board at the beginning of the year to employ a lady in the Department of Physical Training. We were fortunate enough to secure the services of Miss Sarah J. Jacobs, who, at the time of her engagement, was doing private work at Santa Barbara. Miss Jacobs has been thoroughly trained in one of the best Physical Training Schools in the East. She is doing excellent work, and we expect much good will result from her connection with the school.

To bring the Faculty into closer touch with one another, and to strengthen the work, there have been regular weekly meetings of both the Normal and Model School teachers for the discussion of professional topics. These have been in addition to our business meetings. A definite plan of work for the year has been pursued. As a result the teachers have been more interested in the professional, the teaching side of their subjects as applied to the public school work, than ever before, and more thoroughly impressed with responsibility as members of a Normal School Faculty.

In addition to this special work in the school, Dr. Dresslar has directed the professional reading of the teachers in three counties. Believing that the influence of the Normal School should be felt outside of the institution by those in the profession of teaching, we have succeeded in effecting organizations among the teachers of Ventura and Los Angeles counties by which they meet in groups, at least monthly, for the study of subjects connected with their work. This bids fair to bind the whole force of teachers in Southern California into a great active student mass for the improvement of methods in teaching.

Some changes are needed at Los Angeles to enable us to reap the best results from our work. When the new building was erected the only place that seemed available for it was just back of the old building. This position brings it within thirty feet of the Gymnasium, not only shutting out the sunlight from the latter, but also causing the rooms on the lower floor of the Model School to be darkened to an undesirable degree. It seems necessary to remove the Gymnasium about forty feet farther from the Normal building. I regret also to report that, even with this change, some of the Model School rooms that have windows on one side only, will still be poorly lighted. I foresaw this fact when the building was being erected, and asked the architect to provide more windows; but he insisted that they were not necessary. Experience has proved that the rooms are too dark on many days for the well-being of the pupils. This defect can be remedied only by placing iron girders at the end of the rooms and filling the whole space with glass. It is estimated that both of these changes—the moving and repairing the Gymnasium and the better lighting of the rooms in the Model School—can be made for $4,000. I think, therefore, that this Board should indorse an application to the Legislature for this amount.

An important step forward was taken when Sloyd was made a part of the course of study in our Normal Schools. A large number of the most progressive Normal Schools in the United States have already adopted it. As an educational factor in the correct training of our boys and girls, I do not believe it has its equal in the curriculum of the public schools. Though many of our teachers may not be able to make a systematic use of it for some time to come, they will be greatly strengthened in their work in many directions, through a knowledge of Sloyd.

In the matter of further advance in our general educational policy I think there is still one great need; a need which bears the most vital relation to the improvement of popular—that is to say, primary education; a need which the State can meet most adequately and economically by means of her Normal Schools, and a need which she can no longer afford to ignore. Its consideration appropriately lies within the domain of this Board; and it here demands most earnest and thoughtful attention. I refer to the need, now widely recognized by our people, for the more general adoption in our primary work of that enlargement of view and improvement of methods known to the world in Froebel's kindergarten. For the truth and wisdom of Froebel's philosophy of education, there is no lack either of sound reason or of actual demonstration. For proof we need only to turn to the schools of Germany or to those of the most progressive communities of our own land. But in this, perhaps more than any other phase of public education, it is absolutely essential for us to discern between the false and the true. Unhappily, under present conditions, the tendency is for the false to become established among us to the serious obstruction of progress and to the lasting detriment of our children. The demand for kindergarten teachers exists in California. It is met at present by the work of private training classes which must live upon the tuition paid them by their patrons. These classes are, as a rule, "short cuts" to the profession of teaching; places where the grammar-school girl may go, pay her hundred dollars, stay for six months or a year while she picks up a superficial knowledge of the mechanical devices of kindergarten practice, and at the end of this process to be licensed by our county boards and forthwith installed as teacher in the most critical and delicate of all phases of public school work. The injury she may and does do to the children in her charge, and to the cause of education in general, it would be impossible to compute. On the other hand, the good that a real kindergartner of true insight and training might and would do in her place, would be equally beyond computation.

The kindergarten means, in its essence, a revolution in the underlying principles of primary teaching. It means an evolution of power in the mind, instead of merely a dogmatic imposition of knowledge upon the mind. The knowledge is not lost; it comes with the growth of the understanding; but in addition to it is gained the power to make knowledge of use in the affairs of life. This power the old scholasticism did not always conserve. How many men and women have we not all known, filled full of information, perfect walking encyclopædias, yet helpless incompetents in the plain and practical art of living? The better education, which I have spoken of as an evolution of power, proposes to do away with such incompetence. It has in view the mind trained to alertness, order, and patience; the eye to quickness and accuracy; the hand to readiness and skill, so that it springs instinctively to the efficient doing of any work that lays claim upon it.

The better primary education has in view a continuous development of the native powers of each child from four years to fourteen. It allows no gaps, such as now exist, between the work of the kindergarten and of the primary school—no dreary waste of mere intellectual effort in the intermediate grades at the very time when the physical activities are uppermost in the child; and in the work of the grammar grades no maze of doubt and discouragement as to what it all means, but a firm and joyful outlook upon life, with a feeling that the school has done something in the way of definite help toward successful living.

Now, it seems to me that the State stands face to face with the question, "Here is a great engine of power, shall we control it for our lasting benefit and profit, or shall we give it over to unskilled and selfish manipulators to work us untold harm?" In other words, shall the training of these kindergartners and teachers of manual training be entrusted to our State Normal Schools or not? At present not one of the three Normal Schools of California takes any account of the kindergarten in the system of primary education. I think the time has come when they should. We ought to be able to show in our Model Schools what a real kindergarten means. Our graduates ought to know Froebel's true philosophy and practice so well that the darkness of false teaching cannot live in the light of their presence.

I most earnestly urge upon you the necessity of adopting the kindergarten and its logical outgrowth of manual training in the work of our Model Schools, and of adding to the Faculty of each Normal School a kindergarten training teacher of undisputed attainments and ability.

Another important question demands consideration of us who have in our hands the preparation of teachers. This is the strengthening of the special work of the Normal School. I refer to the work that applies directly to the development in the student of the power to teach. This is the peculiar work of a Normal School Faculty around which all of the efforts of the school should center.

As I have said to the members of our own Faculty, an ideal Normal School requires ideal teachers. Every lesson that such teachers give will exemplify right methods of presenting the subject.

Each teacher should be a specialist in one or two subjects. He should outline his work carefully at the beginning of each term, that he may see the end from the beginning and be able to lay special stress where it is most needed. He will thus be able to lead the students to take a general view of the subject, and at the same time he will require from them some special and exhaustive work.

I expect teachers of allied subjects to hold frequent conferences for the purpose of determining how, by correlation, energy of both students and teachers may not be wasted, and how, for the entire school, work may be bound together as a related whole. In addition to a general knowledge of Psychology as applied to the work of teaching, each Normal teacher must have a special knowledge of the Psychology and Pedagogy of the subject taught by him. This should involve not only a knowledge of correct methods of presenting subjects to Normal students, and of the relative culture of each subject to such students, but also a knowledge of the Psychology of the presentation of each subject to primary and grammar grade classes, and a knowledge of the relative value of these subjects in the public school curriculum. Normal teachers should know what may be done with each subject in the different grades, and should have a knowledge of the best material to use as an aid to teaching them in the public schools. I have no sympathy with a Normal School teacher who assumes that when a subject in the curriculum is understood by his classes his work is done, who forgets that he is a teacher of teachers, and that it is necessary to emphasize the pedagogical side of his work. Teachers in a Normal School should be able to go into the public schools and give model lessons in their subjects in any grade. Without this power they must slight the most important phase of their work. Therefore, before a subject is finished, either during the progress of the work, or near its close, teachers should emphasize the pedagogical side. They should discuss with the class some of the best methods of presenting it to children, and how these methods differ from those pursued by older children. The class should plainly understand the place and the relative importance of each subject in the public school curriculum, and should be brought into contact with the best material used in teaching it in the lower grades.

To further this end, there should be frequent conferences by the Director of the Training School with the critic teachers and the Normal teachers, that the work of all may be harmonious. Only in this way can a Normal School become truly professional; and without its professional work we might as well call it a high school or an academy. Only in the way that I have outlined can the whole student body become thoroughly imbued with the idea of the seriousness of their future work. I am thoroughly convinced that, with four years of such work and with the careful weeding out of unfit and incompetent material, we shall be able to prepare a body of teachers who will accomplish results of real value to the State. Such is the ideal toward which we, in the Los Angeles Normal School, are working. But to secure and retain such teachers as I have described, we must pay them. Good service deserves good pay. The teachers in our Normal Schools must be thoroughly trained and entirely devoted to their work. But we must not forget that training takes time, energy, and money. Besides, the everyday school work is arduous, because it must be critical and definite. No man can succeed in Normal School work who could not do better financially in some other profession, by devoting the same time and energy to it that he does to his teaching. How many men would consider it best to give seven years to preparation for special work, as some of our Normal teachers have done, if he then had to take less than $2,500 per year for his labor, with no prospects of advancement?

The Normal Schools of the United States are costing much less per student than any other schools of the same or of higher grade. This is true, also, of the Normal Schools of California. As I have had occasion to observe before, our Normal Schools cost the State less than $100 per student per year, while the University costs the State nearly or quite three times as much. The Normal Schools of Germany cost the government $300 per student yearly; and there only ten students are assigned to one teacher, while our Normal School teachers have from twenty-five to forty. Certainly the Normal Schools cannot very justly be accused of extravagance. Indeed, I believe I can safely affirm that no expenditure of public funds can be made more fruitful of solid returns to the common weal than the expenditure of the money appropriated to the schools in your care. We should feel that these schools are not secondary in importance to any institutions in the land, since the character of the common schools where the masses of our children must be educated will always depend largely upon the kind of training given in our Normal Schools. This fact once clearly realized, no other argument will be needed to establish the necessity of raising these schools to the highest possible degree of efficiency.

I have the honor to be,

Very respectfully yours,

EDWARD T. PIERCE,
Principal State Normal School,
Los Angeles, California.

REPORT OF TRUSTEES

OF

STATE NORMAL SCHOOL

AT CHICO,

FOR THE

FORTY-SIXTH AND FORTY-SEVENTH FISCAL YEARS.

SACRAMENTO:
A. J. JOHNSTON, : : : : : SUPERINTENDENT STATE PRINTING.
1896.

REPORT OF TRUSTEES.

CHICO, October 1, 1896.

To his Excellency JAMES H. BUDD, *Governor:*

SIR: We have the honor to submit the following detailed report of the receipts and expenditures for carrying on the Normal School under our charge, for the forty-sixth and forty-seventh fiscal years.

During this period the increase in the number of pupils over those in attendance during the two previous years has been eight per cent. The success of our graduates, who are located in all parts of the State, has been marked, and fully justifies all the expense incurred for their education.

Since the last session of the Legislature, our course of study has been lengthened from three to four years. This will insure more efficient teachers, but will also necessitate additional expense.

We recommend the following appropriations for the forty-ninth and fiftieth fiscal years:

For current expenses	$56,000
For Library	1,000
For Care and Improvement of Grounds	2,500

Respectully submitted.

F. C. LUSK,
President.

ROBT. F. PENNELL, Secretary.

FINANCIAL REPORT.

FOR THE FORTY-SIXTH FISCAL YEAR, ENDING JUNE 30, 1895.

FUND FOR THE SUPPORT OF THE STATE NORMAL SCHOOL.

Date of Auditing.	Voucher		Dr.	Cr.
1894.				
July 1	----	To balance of appropriation for forty-fifth fiscal year	$19 02	
July 1	----	To appropriation for forty-sixth year	22,000 00	
July 31	----	By payroll for July, 1894		$1,442 47
July 31	1	By supplies (Fetters & Williams)		60 40
July 31	2	By linseed oil (Hubbard, Earll & Co.)		36 97
Aug. 31	3	By sundries		7 11
Aug. 31	4	By advertising		3 00
Aug. 31	5	By supplies (J. A. Stewart & Co.)		162 91
Aug. 31	6	By supplies (Hubbard, Earll & Co.)		12 95
Aug. 31	7	By supplies (Fetters & Williams)		3 00
Aug. 31	8	By wood (Wm. J. O'Connor)		274 75
Aug. 31	9	By labor (J. W. Clark)		37 75
Aug. 31	----	By payroll for August, 1894		1,442 50
Sept. 30	----	By payroll for September, 1894		1,732 53
Sept. 30	10	By supplies (Hubbard, Earll & Co.)		24 36
Sept. 30	11	By supplies (Fetters & Williams)		37 50
Sept. 30	12	By upright piano		250 00
Sept. 30	13	By supplies		19 20
Sept. 30	14	By school desks		32 63
Sept. 30	15	By gymnasium furniture		144 45
Sept. 30	16	By gymnasium furniture		31 50
Oct. 31	----	By payroll for October, 1894		1,732 47
Nov. 30	----	By payroll for November, 1894		1,732 50
Dec. 31	----	By payroll for December, 1894		1,732 53
Dec. 31	17	By supplies (H. N. Gustin)		9 00
Dec. 31	18	By repairs		5 00
Dec. 31	19	By supplies (W. W. Wilson)		15 50
Dec. 31	20	By repairs		8 20
Dec. 31	21	By wood		28 15
1895.				
Jan. 31	----	By payroll for January, 1895		1,732 47
Jan. 31	22	By fifty diplomas		42 50
Jan. 31	23	By supplies (Bancroft Co.)		9 60
Jan. 31	24	By repairs		5 50
Jan. 31	25	By gas		18 00
Jan. 31	26	By freight and drayage		11 09
Feb. 28	----	By payroll for February, 1895		1,732 50
Feb. 28	27	By supplies		36 29
Feb. 28	28	By picture frame		4 00
Feb. 28	29	By labor (G. W. Carney)		19 00
Feb. 28	30	By supplies (Hubbard, Earll & Co.)		23 58
Mar. 31	----	By payroll for March, 1895		1,732 53
April 30	----	By payroll for April, 1895		1,732 47
April 30	31	By supplies (H. N. Gustin)		11 95
April 30	32	By supplies (O. Ditson Co.)		6 35
April 30	33	By supplies (A. L. Nichols)		8 75
April 30	34	By mileage (F. H. Greely)		8 80
April 30	35	By mileage (N. P. Chipman)		7 60
May 31	----	By payroll for May, 1895		1,732 50
June 30	----	By payroll for June, 1895		1,732 53
June 30	36	By sundries (Robt. F. Pennell)		109 35
June 30	37	By furniture		9 50

Fund for the Support—Continued.

Date of Auditing.	Voucher		Dr.	Cr.
1895.				
June 30	38	By sundries		$35 95
June 30	39	By tuning pianos		28 00
June 30	40	By engraving diplomas		23 50
June 30	41	By supplies (A. L. Nichols)		20 00
June 30	42	By gas		32 00
June 30	43	By water		100 00
June 30	44	By supplies (Hubbard, Earll & Co.)		9 00
June 30	45	By supplies (Fetters & Williams)		17 00
June 30	46	By printing		3 40
		By balance		3 98
			$22,019 02	$22,019 02

LIBRARY, GROUNDS, AND MUSEUM FUND.

Date of Auditing.	Voucher		Dr.	Cr.
1894.				
July 1		To balance	$14 40	
		To appropriation for forty-sixth fiscal year	2,500 00	
		By payroll for the year (Gardener)		$780 00
Aug. 31	1	By books		30 44
Aug. 31	2	By books		25 37
Aug. 31	3	By pictures		46 15
Aug. 31	4	By pictures		26 10
Aug. 31	5	By books		4 70
Sept. 30	6	By paper		4 00
Sept. 30	7	By books		21 72
Sept. 30	8	By books		34 41
Nov. 30	9	By museum supplies		16 13
Nov. 30	10	By museum repairs		13 74
Nov. 30	11	By library supplies		4 45
Nov. 30	12	By laboratory supplies		11 00
Nov. 30	13	By library tables		5 25
Nov. 30	14	By museum supplies		2 75
Nov. 30	15	By books		28 80
Nov. 30	16	By museum repairs		26 50
Nov. 30	17	By books		11 04
Nov. 30	18	By books		21 72
Nov. 30	19	By books		130 00
Nov. 30	20	By books		9 00
Nov. 30	21	By museum repairs		46 45
Nov. 30	22	By books		21 41
Nov. 30	23	By museum repairs		27 05
Nov. 30	24	By museum supplies		10 10
Nov. 30	25	By museum supplies		28 41
Nov. 30	26	By books		3 50
Dec. 31	27	By labor		50 75
Dec. 31	28	By supplies		12 70
Dec. 31	29	By books		25 40
Dec. 31	30	By labor		7 50
Dec. 31	31	By microscopes		53 33
Dec. 31	32	By cylinders		60 00
Dec. 31	33	By books		10 00
Dec. 31	34	By labor		15 00
Dec. 31	35	By water		100 00
Dec. 31	36	By books		17 40
Dec. 31	37	By desks		24 40
Dec. 31	38	By labor		17 55

LIBRARY, GROUNDS, AND MUSEUM FUND—Continued.

Date of Auditing.	Voucher		Dr.	Cr.
1895.				
Jan. 31	39	By compound microscope		$60 00
Jan. 31	40	By books		24 00
Jan. 31	41	By museum supplies		33 15
Jan. 31	42	By books		37 70
Jan. 31	43	By fuel		13 50
Jan. 31	44	By museum supplies		4 75
Jan. 31	45	By books		1 20
Jan. 31	46	By museum specimens		50 50
Feb. 28	47	By books		3 31
Feb. 28	48	By lumber		13 43
Feb. 28	49	By photographs		21 69
Feb. 28	50	By books		22 57
Feb. 28	51	By museum supplies		26 38
Feb. 28	52	By labor		5 96
Mar. 31	53	By books		2 40
Mar. 31	54	By books		14 66
Mar. 31	55	By alcohol		62 43
Mar. 31	56	By brokerage on alcohol		15 00
Mar. 31	57	By crayon plates		2 96
Mar. 31	58	By books		3 83
Mar. 31	59	By books		3 00
Mar. 31	60	By laboratory supplies		55 66
Mar. 31	61	By labor		13 60
Mar. 31	62	By kindergarten material		2 77
Mar. 31	63	By labor		49 87
April 31	64	By books		4 50
April 31	65	By alcohol		2 50
April 31	66	By one work horse		32 50
April 31	67	By books		11 70
April 31	68	By laboratory supplies		7 62
April 31	69	By books		5 00
June 30	70	By supplies		115 65
June 30	71	By labor		4 35
		By balance		04
			$2,514 40	$2,514 40

CONTINGENT FUND.

Date of Auditing.	Voucher		Dr.	Cr.
1894.				
July 1		To balance	$214 83	
July 2	1	By postage stamps		$4 00
July 6	2	By lettering diplomas		5 00
Aug. 16	3	By supplies		49 20
Aug. 16	4	By postage		2 75
Aug. 16	5	By books		1 54
Aug. 16	6	By books		2 34
Aug. 16	7	By exchange		4 50
Sept. 1	8	By Cosmoplitan (one year)		1 55
Sept. 6	9	By drayage		4 85
Sept. 8	10	By advertising		2 00
Sept. 8	11	By advertising		2 25
Sept. 8	12	By freight		1 10
Sept. 8	13	By freight		2 81
Sept. 13	14	By lumber		1 75
Sept. 13	15	By New York Nation (one year)		3 00
Sept. 13	16	By exchange		1 85
Sept. 13	17	By photographs		3 05
Sept. 17	18	By lumber		1 50

CONTINGENT FUND—Continued.

Date of Auditing.	Voucher		Dr.	Cr.
1894.				
Sept. 19	19	By exchange		$0 79
Sept. 22	20	By postage		4 00
Sept. 24	21	By freight		2 41
Sept. 26	22	By express		1 16
Sept. 28	23	By stamped envelopes (500)		10 90
Oct. 4		To tuition	$95 50	
Oct. 6	24	By freight and drayage		11 31
Oct. 6	25	By Post Office box (one quarter)		1 50
Oct. 6	26	By lumber		1 75
Oct. 6	27	By lumber		11 13
Oct. 6	28	By livery		4 00
Oct. 6	29	By printing		4 00
Oct. 6	30	By books		3 00
Oct. 6	31	By labor		33 55
Oct. 6	32	By clay		4 95
Oct. 6	33	By sundries		15 60
Oct. 6	34	By printing		4 50
Oct. 6	35	By braid		75
Oct. 6	36	By sundries		2 70
Oct. 9		To tuition	19 50	
Oct. 10	37	By exchange		2 24
Oct. 12		To tuition	38 00	
Oct. 12	38	By books		36 00
Oct. 15	39	By express		3 90
Oct. 15	40	By sundries		8 55
Oct. 20	41	By Harper's Magazine (one year)		4 00
Oct. 20	42	By Statistician		75
Oct. 22		To tuition	139 50	
Oct. 24	43	By exchange		75
Oct. 27	44	By supplies		2 25
Oct. 27	45	By Pedagogical Seminary (two numbers)		3 00
Nov. 3	46	By Century Magazine (one year)		4 00
Nov. 3	47	By Fruit-Grower (one year)		3 00
Nov. 8	48	By exchange		2 24
Nov. 10	49	By lumber		3 00
Nov. 10	50	By supplies		14 14
Nov. 10	51	By supplies		24 73
Nov. 10	52	By Scribner's Magazine (one year)		3 00
Nov. 10	53	By Popular Science Monthly (one year)		5 00
Nov. 10	54	By New England Magazine (one year)		3 00
Nov. 10	55	By North American Review (one year)		5 00
Nov. 10	56	By Review of Reviews (one year)		2 50
Nov. 10	57	By The Forum (one year)		3 00
Nov. 10	58	By labor		3 00
Nov. 10	59	By labor		3 00
Nov. 10	60	By labor		1 20
Nov. 28	61	By lumber		2 50
Nov. 28	62	By lumber		6 00
Dec. 8	63	By supplies for Physical Laboratory		17 55
Dec. 11	64	By express		2 35
Dec. 15	65	By New York Independent (one year)		3 00
Dec. 15	66	By weaving material		2 14
Dec. 15	67	By sundries		3 10
Dec. 15	68	By Harper's Young People (one year)		2 00
Dec. 15	69	By sundries		2 70
Dec. 19	70	By exchange		2 24
Dec. 20	71	By labor		6 10
Dec. 20	72	By labor		3 45
Dec. 21	73	By postage stamps		5 00
Dec. 21	74	By advertising		1 25
Dec. 21	75	By labor		1 80
Dec. 21	76	By labor		2 35
Dec. 22	77	By labor		3 85
Dec. 22	78	By one broom		75
Dec. 22	79	By labor		15 00

CONTINGENT FUND—Continued.

Date of Auditing.		Voucher		Dr.	Cr.
1895.					
Jan.	4	80	By Post Office box (one quarter)		$1 50
Jan.	4	81	By The School Review (one year)		1 50
Jan.	10	82	By The Educational Review (one year)		3 00
Jan.	12	-----	To tuition	$167 00	
Jan.	15	83	By labor		7 50
Jan.	19	84	By sundries		4 81
Jan.	19	85	By labor		7 85
Jan.	20	86	By freight		7 40
Feb.	2	87	By labor		19 00
Feb.	2	88	By lumber		6 62
Feb.	2	89	By oil of cloves		11 20
Feb.	2	90	By supplies		16 45
Feb.	28	91	By wheat		3 70
Feb.	28	92	By labor		1 30
Mar.	1	93	By labor		12 03
Mar.	1	94	By supplies		3 60
Mar.	1	95	By chloroform		5 70
Mar.	2	96	By supplies		7 98
Mar.	4	97	By supplies		1 30
Mar.	4	98	By freight		25
Mar.	5	99	By exchange		40
Mar.	12	100	By supplies		7 50
Mar.	15	101	By exchange		2 25
Mar.	15	-----	To tuition	117 25	
Mar.	15	102	By livery		6 00
Mar.	18	103	By sundries		2 25
Mar.	22	104	By weedcutters		1 50
Mar.	22	105	By sundries		2 00
Mar.	25	106	By one working horse		25 00
Mar.	25	107	By freight and drayage		4 28
Mar.	28	108	By labor		5 25
Mar.	28	109	By hay		3 25
Mar.	28	110	By exchange		22
Mar.	28	111	By sundries		90
Mar.	29	112	By magnifying glasses (two)		5 00
Mar.	30	113	By Education (two years)		6 00
Mar.	30	114	By supplies		15 15
Mar.	30	115	By supplies		13 00
Mar.	30	116	By supplies		10 85
Mar.	30	117	By supplies		2 25
Mar.	30	118	By one tank		7 50
April	1	119	By labor		5 00
April	1	120	By sundries		1 25
April	2	121	By chloroform		5 25
April	3	122	By Post Office box (one quarter)		1 50
April	4	123	By hooks		2 00
April	18	124	By exchange		2 25
April	18	125	By Secretary Joint Board		20 00
April	22	126	By sundries		5 80
April	22	127	By lettering diplomas		4 00
April	22	128	By sundries		6 70
April	22	129	By books		3 10
April	22	130	By labor		5 00
April	22	131	By labor		13 60
May	1	-----	To tuition and cash	219 10	
May	2	132	By exchange		30
May	3	133	By drayage		1 80
May	3	134	By sundries		1 05
May	6	135	By manual of music		10 00
May	10	136	By lecture		15 00
May	13	137	By express		3 20
May	17	138	By lumber		75
May	17	139	By labor		10 00
May	21	140	By lime		1 80
May	21	141	By exchange		2 38
May	22	142	By sundries		3 40
May	25	143	By books		23
May	25	144	By chloroform		5 25

CONTINGENT FUND—Continued.

Date of Auditing.	Voucher		Dr.	Cr.
1895.				
May 25	145	By crayon		$1 50
May 25	146	By books		2 61
May 25	147	By American Academy (one year)		5 00
May 25	148	By one chair		9 50
May 25	149	By advertising		5 75
May 25	150	By coal oil		1 50
May 25	151	By brush		1 00
May 25	152	By posts		3 48
May 30	153	By expenses to see candidates		24 70
June 6	154	By sundries		35 95
June 7	155	By express		3 00
June 8	156	By postage stamps		4 00
June 8	157	By palm trees		2 00
June 8	158	By garden seeds		3 51
June 8	159	By exchange		2 24
June 15	160	By labor		10 00
June 15		To tuition and cash	$24 47	
June 15	161	By supplies		14 75
June 16	162	By baccalaureate sermon		25 00
June 19	163	By livery		4 00
June 19	164	By ribbon		7 50
June 20	165	By music		15 00
June 21	166	By printing		3 00
June 21	167	By sundries		3 00
June 25	168	By sundries		6 20
June 26	169	By telegrams		1 20
		By balance		29 01
			$1,035 80	$1,035 80

FOR THE FORTY-SEVENTH FISCAL YEAR, ENDING JUNE 30, 1896.

FUND FOR THE SUPPORT OF THE STATE NORMAL SCHOOL.

Date of Auditing.	Voucher		Dr.	Cr.
		To appropriation for forty-seventh fiscal year	$26,000 00	
		By payroll for July, 1895		$1,692 48
		By payroll for August, 1895		1,692 50
		By payroll for September, 1895		1,964 52
		By payroll for October, 1895		1,964 48
		By payroll for November, 1895		1,964 50
		By payroll for December, 1895		1,964 52
		By payroll for January, 1896		1,964 48
		By payroll for February, 1896		1,964 50
		By payroll for March, 1896		1,964 52
		By payroll for April, 1896		1,964 48
		By payroll for May, 1896		1,964 50
		By payroll for June, 1896		1,964 52
1895.				
Aug. 31	1	By supplies		183 80
Aug. 31	2	By postage		5 00
Aug. 31	3	By laboratory supplies		6 50
Aug. 31	4	By toweling		11 45
Aug. 31	5	By supplies		51 40
Aug. 31	6	By repairs		20 00
Sept. 30	7	By lumber		12 10
Sept. 30	8	By chemicals		20 45
Sept. 30	9	By desks		98 44

Fund for the Support—Continued.

Date of Auditing.	Voucher		Dr.	Cr.
1895.				
Sept. 30	10	By photographs		$23 60
Sept. 30	11	By supplies		47 00
Oct. 31	12	By drawing supplies		95 34
Oct. 31	13	By drawing supplies		36 75
Oct. 31	14	By diplomas		41 50
Oct. 31	15	By books		20 24
Oct. 31	16	By supplies		6 50
Nov. 30	17	By fuel		172 37
Nov. 30	18	By lumber		37 10
Dec. 31	19	By gas (six months to date)		37 60
Dec. 31	20	By chemicals		12 80
Dec. 31	21	By repairs		26 00
Dec. 31	22	By repairs		18 85
Dec. 31	23	By repairs		19 00
Dec. 31	24	By optical supplies		9 28
Dec. 31	25	By music		18 76
Dec. 31	26	By biological supplies		35 23
Dec. 31	27	By books		23 75
1896.				
Jan. 31	28	By alcohol		6 50
Jan. 31	29	By general supplies		34 96
Jan. 31	30	By general supplies		3 25
Jan. 31	31	By books and supplies		48 80
Jan. 31	32	By books and supplies		52 29
Jan. 31	33	By books		8 90
Jan. 31	34	By music		4 56
Jan. 31	35	By museum supplies		34 35
Feb. 29	36	By lettering diplomas		11 50
Feb. 29	37	By gas		46 50
Feb. 29	38	By gas-burner		2 50
Feb. 29	39	By water		16 00
Feb. 29	40	By supplies		44 19
Feb. 29	41	By supplies		2 75
Feb. 29	42	By repairs		30 50
Feb. 29	43	By supplies		10 50
Feb. 29	44	By supplies		11 05
Feb. 29	45	By museum supplies		5 15
April 30	46	By mileage to San José (John Bidwell)		44 60
April 30	47	By mileage to San José (F. C. Lusk)		44 60
April 30	48	By mileage to San José (N. P. Chipman)		52 40
April 30	49	By mileage to San José (F. H. Greely)		35 80
April 30	50	By mileage to San José (Geo. Ohleyer)		36 20
April 30	51	By mounting specimens		10 00
April 30	52	By chemicals		2 75
April 30	53	By tuning pianos		20 00
April 30	54	By water for April		16 00
April 30	55	By gas for April		1 00
April 30	56	By supplies and labor		15 00
June 30	57	By supplies		54 40
June 30	58	By water for June		17 00
June 30	59	By gas for June		5 60
June 30	60	By supplies		23 35
June 30	61	By Contingent Fund (supplies)		356 54
		By balance		769 61
			$26,000 00	$26,000 00

FUND FOR CARE AND IMPROVEMENT OF GROUNDS.

Date of Auditing.	Voucher		Dr.	Cr.
		To appropriation for forty-seventh fiscal year	$1,250 00	
		By payroll for July, 1895		$65 00
		By payroll for August, 1895		65 00
		By payroll for September, 1895		65 00
		By payroll for October, 1895		65 00
		By payroll for November, 1895		65 00
		By payroll for December, 1895		65 00
		By payroll for January, 1896		65 00
		By payroll for February, 1896		65 00
		By payroll for March, 1896		65 00
		By payroll for April, 1896		65 00
1896.				
Dec. 31	1	By water (six months to date)		100 00
Jan. 31	2	By graveling walks and drives		140 70
Jan. 31	3	By gate-posts and gravel		18 95
Feb. 29	4	By repairs on fence		8 60
Mar. 31	5	By labor		45 85
Mar. 31	6	By water (February and March)		34 00
Mar. 31	7	By grading street (assessment)		300 08
		To balance	48 18	
			$1,298 18	$1,298 18

CONTINGENT FUND.

Date of Auditing.	Voucher		Dr.	Cr.
1895.				
July 1		To balance	$29 01	
July 1	1	By Post Office box (one quarter)		$1 50
July 30	2	By books		21 38
July 30	3	By hay		7 15
July 30	4	By books		1 20
July 30	5	By supplies		4 35
July 30	6	By Chronicle-Record (one year) to July, 1895		5 00
July 30	7	By Enterprise (one year) to July, 1895		5 00
July 30	8	By S. F. Chronicle (10 months) to July, 1895		6 50
Aug. 1	9	By sundries		1 30
Aug. 2	10	By books		5 00
Aug. 2	11	By Chronicle-Record (one year) to July, 1896		5 00
Aug. 2	12	By Enterprise (one year) to July, 1896		5 00
Aug. 2	13	By S. F. Chronicle (one year) to July, 1896		7 80
Aug. 2	14	By telephone		6 45
Aug. 5	15	By telegraph		1 95
Aug. 5	16	By books		8 75
Aug. 7	17	By postage stamps		2 50
Aug. 9	18	By sundries		1 45
Aug. 10	19	By sundries		3 75
Aug. 12	20	By supplies		6 00
Aug. 12	21	By express		3 65
Aug. 15	22	By postage		1 50
Aug. 19	23	By freight and drayage		50
Aug. 19	24	By incidentals		17 30
Aug. 31	25	By livery		4 00
Sept. 6	26	By optical supplies		4 75
Sept. 6	-----	To tuition and cash	97 50	
Sept. 14	27	By paper tray		1 00
Sept. 14	28	By supplies		2 10
Sept. 21	29	By advertising		5 25
Sept. 21	30	By advertising		2 50
Sept. 21	31	By supplies		1 35

CONTINGENT FUND—Continued.

Date of Auditing.	Voucher		Dr.	Cr.
1895.				
Sept. 21	32	By books		$5 40
Sept. 21	33	By express		1 25
Sept. 21	34	By Microscopical Journal		2 00
Sept. 21	35	By telephone		5 85
Sept. 21	36	By supplies		3 90
Sept. 27	37	By labor		5 00
Sept. 30	38	By supplies		8 95
Oct. 3	39	By lumber		8 80
Oct. 4	40	By telegrams		5 15
Oct. 7	41	By freight		8 05
Oct. 7	42	By books		2 24
Oct. 7	43	By labor		25 00
Oct. 7	44	By drayage		2 00
Oct. 12	45	By advertising		2 50
Oct. 12	46	By repairing clocks		8 50
Oct. 12	47	By lumber		5 40
Oct. 16	48	By telephone charges		4 40
Oct. 19	49	By supplies		18 95
Oct. 19	50	By hay		8 40
Oct. 19	51	By Cosmopolitan (one year)		1 20
Oct. 19	52	By supplies		10 35
Oct. 19	53	By supplies		24 00
Oct. 19	54	By supplies		23 75
Oct. 19	55	By supplies		50
Oct. 26	56	By labor		3 00
Oct. 26	-----	To tuition	$246 50	
Oct. 26	57	By supplies		75
Oct. 26	58	By repairs		1 85
Oct. 26	59	By soap		3 60
Oct. 26	60	By express		8 20
Nov. 2	61	By labor		10 00
Nov. 4	62	By supplies		95
Nov. 5	63	By lumber		2 43
Nov. 6	64	By lumber		1 68
Nov. 6	65	By supplies		45
Nov. 6	66	By telegram		33
Nov. 6	67	By telephone		6 00
Nov. 11	68	By drayage		1 50
Nov. 12	69	By drayage		1 50
Nov. 12	70	By New York Observer (one year)		4 00
Nov. 16	71	By Harper's Round Table (one year)		2 00
Nov. 19	72	By sundries		3 60
Nov. 23	73	By labor		5 00
Nov. 23	74	By Overland Monthly (one year)		3 00
Nov. 23	75	By supplies		2 56
Nov. 30	76	By supplies		8 90
Dec. 2	77	By ice		1 00
Dec. 2	78	By supplies		3 61
Dec. 2	79	By supplies		1 87
Dec. 2	80	By supplies		1 01
Dec. 2	81	By telephone		7 95
Dec. 9	82	By books		12 00
Dec. 9	83	By express		2 80
Dec. 11	84	By School Review (one year)		1 50
Dec. 11	85	By furniture		21 00
Dec. 11	86	By labor		1 50
Dec. 11	-----	To tuition	190 75	
Dec. 14	87	By lumber		12 90
Dec. 20	88	By supplies		4 61
Dec. 20	89	By supplies		38 00
Dec. 20	90	By labor		5 00
1896.				
Jan. 2	91	By Post Office box (one quarter)		1 50
Jan. 4	92	By supplies		23 85
Jan. 7	93	By exchange		2 33
Jan. 7	94	By express		50
Jan. 7	95	By telephone		4 00
Jan. 7	96	By Educational Review (one year)		3 00

CONTINGENT FUND—Continued.

Date of Auditing.	Voucher		Dr.	Cr.
1896.				
Jan. 11	97	By lumber		$1 33
Jan. 11	98	By photographs		76 95
Jan. 11	99	By telegrams		1 54
Jan. 17	100	By lumber		80
Jan. 17	101	By ribbon		7 05
Jan. 17	102	By printing		6 00
Jan. 18	103	By printing		4 00
Jan. 19	104	By sundries		2 85
Jan. 24	105	By express		3 00
Jan. 24	106	By telegrams		4 08
Jan. 25	107	By supplies		3 60
Jan. 28	108	By addresses (David Starr Jordan)		50 00
Jan. 29	109	By Review of Reviews (one year)		2 50
Jan. 30	110	By advertising		8 56
Jan. 31	111	By drayage		1 67
Feb. 1	112	By supplies		1 00
Feb. 1	113	By livery		13 00
Feb. 3	114	By telephone		6 10
Feb. 3	115	By labor		5 75
Feb. 5	116	By Journal of Education (one year)		2 50
Feb. 5	117	By postage stamps		5 05
Feb. 8	118	By supplies		4 66
Feb. 8	119	By supplies		21 95
Feb. 8	120	By supplies		1 20
Feb. 8		To tuition and cash for supplies	$108 01	
Feb. 10	121	By hay		9 20
Feb. 10	122	By exchange		2 38
Feb. 21	123	By labor		5 00
Feb. 27	124	By Education (one year)		3 00
Feb. 28	125	By books		15 00
Mar. 3	126	By telephone		4 00
Mar. 13	127	By lumber		1 81
Mar. 16	128	By optical supplies		7 50
Mar. 17	129	By exchange		2 21
Mar. 19	130	By supplies		9 05
Mar. 20	131	By labor		5 00
Mar. 23	132	By gas		19 40
Mar. 23	133	By freight and drayage		85
Mar. 24	134	By oil of cloves		7 60
Mar. 26	135	By one small gear		1 55
Mar. 28	136	By repairs		24 45
Mar. 28	137	By labor		3 00
Mar. 28	138	By supplies		4 50
Mar. 28	139	By supplies		1 25
Mar. 28	140	By freight		1 95
Mar. 31	141	By music		11 27
Mar. 31	142	By music		6 60
Mar. 31		To tuition	259 00	
Mar. 31	143	By books		28 53
Mar. 31	144	By charging cylinders		10 00
April 1	145	By Post Office box (one quarter)		1 50
April 1	146	By telephone		4 00
April 1	147	By express		95
April 2	148	By express		1 00
April 11	149	By repairs		3 50
April 11	150	By exchange		1 96
April 11	151	By supplies		1 00
April 18	152	By supplies		50
April 18	153	By expenses to joint meeting (R. F. Pennell)		18 30
April 23	154	By repairs		1 25
April 27	155	By labor		3 10
April 30	156	By freight		50
May 1	157	By telephone		4 00
May 8	158	By lumber		6 30
May 8	159	By books		1 80
May 11	160	By postage		4 00
May 12	161	By exchange		2 61
May 14	162	By freight		51

CONTINGENT FUND—Continued.

Date of Auditing.	Voucher		Dr.	Cr.
1895.				
May 22	163	By telegrams		$2 20
May 23	164	By chloroform		4 76
May 23	165	By labor		15 00
May 23	166	By labor		10 00
May 23	167	By express		50
May 23	168	By supplies		5 45
May 23	169	By supplies		4 00
May 23		To tuition and cash for supplies	$260 95	
May 23	170	By labor		12 00
May 23	171	By fuel		9 50
May 23	172	By water		17 00
May 27	173	By garden hose		10 30
May 27	174	By printing		4 00
May 28	175	By books		4 80
May 30	176	By express		3 50
May 30	177	By labor		50
May 30		To tuition	42 70	
June 1	178	By supplies		8 60
June 1	179	By lettering diplomas		12 00
June 1	180	By gas for May		4 60
June 2	181	By botany labels		1 00
June 2	182	By rent for organ		10 00
June 4	183	By telephone		5 75
June 4	184	By exchange		1 95
June 4	185	By advertising in school paper		10 00
June 5	186	By repairs		18 25
June 14	187	By printing		6 00
June 15	188	By lumber		1 62
June 15	189	By supplies		5 00
June 15	190	By baccalaureate sermon		15 00
June 15	191	By Commencement music		14 00
June 17	192	By supplies		7 75
June 22	193	By Commencement notices		1 50
June 22	194	By express		50
June 30	195	By exchange		2 41
June 30	196	By express		2 05
June 30	197	By supplies		52 00
June 30	198	By Peter Knudsen (pay for May)		65 00
June 30	199	By Peter Knudsen (pay for June)		65 00
June 30	200	By sundries		12 75
June 30		To Normal School State Fund	356 54	
June 30		By balance		124 00
			$1,590 96	$1,590 96

LOWER YOSEMITE FALLS

[illegible]

YOSEMITE FALLS

THREE BROTHERS

YOSEMITE FALLS

BIENNIAL REPORT

OF THE

Commissioners to Manage Yosemite Valley

AND

MARIPOSA BIG TREE GROVE,

FOR THE YEARS 1895-96.

SACRAMENTO:
A. J. JOHNSTON, : : : : : SUPERINTENDENT STATE PRINTING.
1896.

COMMISSIONERS

TO MANAGE THE

YOSEMITE VALLEY AND THE MARIPOSA BIG TREE GROVE.

HON. JAMES H. BUDD, GOVERNOR OF CALIFORNIA,
Ex Officio President.

HENRY K. FIELD,
Vice-President.

JOHN F. SHEEHAN .... Secretary and Treasurer.
Office, Mills Building, San Francisco.

COMMISSIONERS.

HENRY K. FIELD, Alameda	Term expired.
CHARLES G. CLINCH, San Francisco	Term expired.
JOHN BOGGS, Princeton	Term expired.
CHAS. S. GIVENS, San Francisco	Term expires April 19, 1898.
MAX GOLDBERG, San Francisco	Term expires April 19, 1898.
E. P. JOHNSON, Los Angeles	Term expires April 19, 1898.
H. J. OSTRANDER, Merced	Term expires April 19, 1898.
MILES WALLACE, Madera	Term expires April 19, 1900.

GALEN CLARK .... Guardian.

REPORT.

To his Excellency James H. Budd, *Governor of the State of California:*

Sir: The Commissioners to Manage Yosemite Valley and Mariposa Big Tree Grove have the honor to present this report of their transactions in the management of the State's reservations for the years 1895 and 1896.

The meager appropriations, especially those made by the last Legislature, for the care of the Valley and Grove, confined the Commissioners in the matter of expenditures generally to the maintenance of roads, trails, bridges, and hotels and other buildings in a state of repair, the extraordinary work being the rebuilding of the Pohono bridge, below the Bridal Veil Falls, which was washed away by a freshet during the winter of 1894; the construction of a bridge at Cascade Falls, and a bridge across the Merced River opposite "El Capitan." Other necessary work done during the period covered by this report was the construction of a stable and corral in connection with the Stoneman House; extensive repairs to the Glacier Point Hotel (costing about $1,500), which hostelry was almost uninhabitable; the opening of the road from the stables to the Sentinel Hotel; repapering and interior painting of the Stoneman House; painting of roof and porches of the same house; construction of an ice-house at Mirror Lake; also repairs and additions to the Sentinel Hotel, such as construction of wood-house, carriage-house, and house for servants, and a thorough bracing of roof of hotel, together with painting of porches, etc.

The same close economy adhered to by the Commissioners during the past year must necessarily be followed during the forty-eighth fiscal year, inasmuch as the appropriations for the forty-seventh and forty-eighth fiscal years were reduced nearly one half from appropriations of former years. Thus, the funds at the disposal of the Commissioners, including the amounts received from rents and privileges in the Valley, now amount to only about $11,000 per annum. Yet, in the meantime, buildings may be burned, bridges destroyed, the wonderful big trees endangered, and the winter's ravages so disfigure trails and roads as to involve a large expenditure of money to repair them. This action of the Legislature was, in our opinion, due to reports of malicious or ignorant persons, who were constantly misrepresenting in person, on the floors of both houses, or by letter, the condition of the Valley, and its management. The Commissioners were even accused by legislators with charging extortionate toll rates on roads leading to the Valley, and encouraging monopoly in transportation lines, when such people should have known that the Commission controls no roads outside of the Yosemite Reservation, and charges no toll over roads within it. The toll rates in question are fixed by the Board of Supervisors of the counties which they traverse.

Changes in the personnel of the Board of Commissioners since the last biennial report have been as follows: In December, 1894, Mr. John F. Kidder resigned as Commissioner, and Mr. John Boggs, of Colusa County, was appointed by Governor Markham to fill the vacancy. In January, 1895, Governor James H. Budd, in accordance with law, assumed the Presidency of the Commission. Mr. Boggs was substituted as a member of the Executive Committee in place of Mr. Kidder, resigned. At the annual meeting held in the Yosemite Valley in June, 1895, Commissioners Henry K. Field, John H. O'Brien, and Charles G. Clinch were elected to constitute the Executive Committee, and Commissioner Field was chosen chairman of said committee. In August, 1896, Commissioner John H. O'Brien died, and in October the Governor appointed his successor in the person of Mr. Charles S. Givens, of San Francisco. At the annual meeting held in the Valley in June, 1896, the Executive Committee was abolished by adoption of amendments to the by-laws, and a Committee on Finance and Accounts was provided for and appointed by the President, the general duties of said Committee being to audit and approve all claims against the Commission and inquire into the sources of revenue. Just previous to the printing of this report, the Governor appointed Mr. Miles Wallace, of Madera, to succeed Commissioner George B. Sperry, resigned.

INSPECTION BY THE GOVERNOR.

The last annual meeting held in the Valley was attended by every member of the Commission, the Governor presiding. The Governor, as President of the Commission, made a thorough inspection of the Valley and Grove and all properties of the State under the control of the Board, and made a searching inquiry into all affairs and business appertaining to the Grant. In this he was assisted by all the Commissioners, and as a result many reforms have been instituted which cannot fail to redound to the credit of the State of California, and prove beneficial to the interest of Yosemite Valley and Mariposa Big Tree Grove and the thousands of people who annually visit those marvelous creations of nature.

Any semblance of pooling between hotel proprietors and stage companies was stamped out; competition in transportation to and from the Valley has been encouraged and actually established, thereby insuring cheaper rates; charges for horses and carriage hire have been reduced and generally regulated, and provision has been made for the better accommodation of the two thousand and more campers who annually visit Yosemite. A patrolman visits the various camps several times daily and lends assistance and advice to campers and directs visitors as to important rules and regulations governing the Valley, thereby preventing vandalism by thoughtless persons; a meat market and bakery have been established in the Valley, and arrangements have been made by which campers can purchase hay at cost; pasture fields have been inclosed by portable fencing, into which stock of campers may be turned and kept in safety; all barbed wire fences have been removed from the Valley—all of these tending to the benefit of the campers both in purse and matters of general enjoyment.

CONDITION OF THE FLOOR OF THE VALLEY.

The attention of the Legislature is respectfully called to the condition of the floor of the Valley, and unless ample appropriation of funds is provided very soon, serious and lasting damage will result to the matchless property entrusted to the care of the State of California. The veteran Guardian, in his last report to this Board, says: "It is an evident fact that there are entirely too many young forest trees and small shrubbery spreading over the floor of the Valley, which, as it increases in extent and size, is a fearful menace to the safety and beauty of the landscape scenery, in the event of fires getting started. It has become a matter of urgent necessity that this luxuriant, wanton growth of young pines and cedars should in many places be cleared up or thinned out into open coppice groves. In doing this work much of the young growth and fallen trees could be cut into firewood and sold to residents of the Valley, and I would here suggest and recommend that as a matter of great policy the Yosemite Commissioners should have all the wood cut which is needed for use in Yosemite by the residents, even if some of it was sold for less than the cost of cutting, as the Valley could then be cleared up of old logs and brush where most needed. I would again respectfully call your attention to the condition of the banks of the Merced River here in Yosemite. The strong, rapid currents produced by the annual spring floods are doing serious and alarming damage in a few places. The work done three years ago to divert the strong current and save the river bank and the noted large sugar pine tree just below the mouth of Teneyia Creek seems to be only a partial success."

THE ROADS AND RIVER.

In this connection it is proper to state that the Bureau of Highways of California, the members of which visited Yosemite Valley in June, 1895, made a report to the Governor, dated July 6, 1895, in which they stated that they made an examination of the roads in the Valley with a view of improving said roads to such extent as was possible with the materials and conditions therein existing. They also made an examination of the banks of the Merced River with a view to the improvement and protection of its banks through the Valley at points where severe erosion was taking place. It was found that, of the 22 miles of road in the Valley, at least 15 miles was heavy with sand and dust during the greater portion of the summer season, and the Bureau recommended that the roads be puddled with a finely pulverized sedimentary deposit which is to be found in several localities in the Valley, and which by use and sprinkling will very materially improve the heavy condition of the roads so justly complained of by the Commissioners and visitors. This material is a black loam, of which the better portions of the roads in the Valley are built, and which, if spread over the sandy portions to a depth of from four to six inches and to a width required to the amount of traffic on the road, and if kept well sprinkled, will make these sandy and dusty roads as good as the best in the Valley. The Bureau also recommended that in the matter of replacing bridges, culverts, and drains, the exclusive use of stone in either dry or mortar-laid masonry be resorted to, inasmuch as the only materials for such work necessary to transport into the Valley would be cement and tools, all other materials existing in the Grant in great abundance and of superior quality. They add: "Wherever stone has been used as curbing, retaining walls, abutments, and all other needful road structures, we find that care and skill have been exercised in the workmanship, and commend an extension of this class of work whenever temporary structures are replaced. In the approach to the Valley, via the Coulterville road at Cascade Creek, a dangerous and troublesome crossing exists. At this point, it is advisable to concentrate the stream in a fixed channel, and construct a permanent bridge in stone or of iron beams embedded in cement. A complete topographical map of the Valley, showing all roads and trails, is much needed, as existing maps were made prior to the construction of many of the roads." The report further says: "Regarding the protection of the banks from erosion, we will state at the outset that considerable outlay must be incurred, for throughout the entire Valley a gradual shifting of the channel of the Merced River from side to side has gradually taken place. These changes were of minor importance prior to the construction of costly buildings and roads and the general improvement to the floor of the Valley, but with the introduction of costly improvements there comes the necessity of measurably fixing the channel so that these changes may not destroy valuable grounds, trees, and improvements. An attempt has been made to protect the right bank of the river in the camping-grounds above the stables. Here, a mag-

YOSEMITE VALLEY FROM ARTIST POINT

HALF DOME AND CLOUDS REST YOSEMITE VALLEY

nificent specimen of the sugar pine is in danger of destruction. A small spur dike built above this tree has caused a destructive eddy, and unless prompt steps be taken, the bank and this tree will be destroyed. Being one of the finest specimens of the perishing species, the Commission would be justified in a considerable expenditure to save it for future generations. The work necessary to do this is also the initial step toward protecting the bank for at least a quarter of a mile below, where there is very severe erosion going on, which may result in diverting the river entirely from its present channel for a mile or more."

WORK RECENTLY PERFORMED.

It was deemed an imperative necessity to construct two bridges during the present season—one on the Coulterville road at the crossing of Cascade Creek, and another across the Merced River near Bridal Veil Falls, on the site of the iron bridge which was destroyed by a freshet some time ago. The absence of a bridge at the Cascades has been a constant menace to the safety of travelers on the Coulterville road, and the convenience of visitors to the Valley demanded the construction of the other bridge.

Among the recent orders of the Commissioners is a rule which requires that in the future all leases for any privileges or concessions in the Valley exceeding in rental the sum of $100 per annum shall be advertised and let to the highest responsible bidder.

We have the honor to present herewith a financial statement for the forty-sixth and forty-seventh fiscal years. This statement shows the receipts and expenditures by funds, and in the latter respect the amount expended for labor, improvements on hotels and other buildings, and for bridges, etc., are given. For all expenditures, vouchers showing every item are on file in the office of the Secretary in San Francisco, and with the State Controller. An expert annually makes a thorough examination of the books and accounts of the Secretary and Treasurer.

DESTRUCTION, BY FIRE, OF THE STONEMAN HOUSE.

During the compilation of this report, the Stoneman House was totally destroyed by fire, on the morning of August 24, 1896. This elegant frame hotel was built by the State in 1887, the original cost being $40,000. Since its completion, however, a considerable sum of money has been spent in repairs upon the building, and, inasmuch as the State prohibits insurance upon its buildings, the loss is a heavy one. The origin of the fire is unknown, although the insurance adjuster attributes it to the weight of snow of last winter settling the roof, thereby causing the cracking of the concrete around the flues, there being no brick chimneys in the building. The loss of this hotel has upset the plans of the Commissioners in many respects. At the last annual meeting held in the Valley every precaution was taken to prevent hotel proprietors from pooling, in order that there should be a healthy competition in the interest of tourists. Now the Commissioners are not only confronted with a loss of income of $1,200 per year, by reason of the destruction of the hotel, but it is imperatively necessary to provide accommodations for next season's travel to the Yosemite, other than can be offered by the Sentinel Hotel, the only public house now in the State's Reservation, except the house on Glacier Point, which has but few rooms for the accommodation of guests. A new hotel cannot be constructed in time for the season of 1897, even though ample appropriations be made therefor by the Legislature, and it therefore behooves the Commissioners to have cottages constructed in the immediate vicinity of the Sentinel Hotel, or else renovate and refit the old buildings in that neighborhood, as a temporary device. In order to carry out the latter proposition even, the aid of the Legislature must be invoked to provide the necessary funds, as the money at the disposal of the Commissioners for the present fiscal year will scarcely pay the absolutely necessary expenses of caring for the Valley.

RECOMMENDATIONS.

The Commissioners respectfully recommend and earnestly request that a much larger appropriation of money be placed at their disposal for the ensuing two years than was allotted for the forty-seventh and forty-eighth fiscal years. That meager appropriation has kept the funds in a cramped condition, and has prevented the Commissioners from having work performed in the Valley which they deemed necessary, and which the public demand. Better roads are required in the Valley, and a portion of the roads should be sprinkled during the summer months. A school-house is much needed in the Valley, and one built of stone meets general approval. Paths for the convenience of pedestrians should be constructed on the shores of Mirror Lake, and at certain points along the Merced River. As has been often recommended, the expenditure of a considerable sum of money is required in clearing the floor of the Valley of brush and rapidly growing pines and other young trees. And tourists will no doubt demand the erection of a new hotel, or the enlargement of the present one, together with a number of cottages. These needed improvements will require a special appropriation by the Legislature, and it is to be hoped that that body will appoint a committee to inquire into the wants of the Yosemite.

SUGGESTIONS BY GUARDIAN CLARK.

Yosemite Valley, Cal., August 13, 1896.

Gen. John F. Sheehan, *Secretary and Treasurer of the Yosemite Commission:*

Dear Sir: In replying to your favor of the 6th inst., relative to any suggestions I might offer to incorporate in your biennial report to the Governor and Legislature, I would respectfully suggest that some mention be made for what purposes the interests of Yosemite will require a liberal appropriation of money to be expended during the next two years. Outside and independent of the regular heavy annual expenses in keeping the carriage-roads, trails, bridges, and buildings in safe repair, the old wooden stairway at the Vernal Falls, which is now unsafe for use, will have to be replaced by a new set, either iron or wood. Some efficient system for the protection and preservation of the banks of the Merced River in Yosemite from the strong flood currents in the early part of the season is most imperatively required.

All the open meadow ground in Yosemite is being covered with young cottonwoods and willows, and the drier portions of the Valley overrun with dense thickets of young pines and cedars. The great work of reclamation should be commenced as soon as possible, and prosecuted from year to year, until the whole Valley is again restored to its original superior beauty. I hope that a very liberal appropriation may be obtained for the general protection and preservation of Yosemite, and I think the Governor will favorably recommend it.

Yours respectfully,

GALEN CLARK,
Guardian.

ELECTRIC LIGHTING IN THE YOSEMITE VALLEY.

To the President and Board of Yosemite Valley and Big Tree Grove Commissioners:

In compliance with your request of recent date, I take pleasure in submitting the following report concerning the proposed plan of utilizing the natural water-power of the Yosemite Valley for the production of electrical energy to be used for electric lighting and power purposes throughout the Valley.

The following points should be given careful consideration in the design and construction of such a system:

Careful measurements should be made of the flow of water in the various available streams of the Valley, especially during the late summer. During August, September, and October, the amount of water available for power purposes in many of the streams leading into the Valley would not be sufficient to operate the system. It may be urged that during these months lights would not be in use, but in my opinion the plant should be so located and designed that it can be operated during the entire year.

The head works of the hydraulic system should be so located and constructed that the high water in June can do no damage, or in any way impair the continuous operation of the plant. The pipe-line to the jet-wheels in the station should head in a reservoir of such a capacity that the plant could be operated for a number of days by the water there contained. It would then be possible to repair the head works, if necessary, without interfering with the operation of the lighting plant.

The construction must be such that no damage can be done by snow and ice and freezing water during the winter months. If steel pipe is used it must be protected from the heat of the sun during the summer, or other construction used to minimize the effect of contraction and expansion due to change of temperature.

Great care should be taken in the design and construction of the entire system, so that the natural beauty of the surroundings will not be destroyed by the necessary artificial work. All the assistance which nature can give should be promptly utilized.

The power-house should be built of granite. The recent destruction of the Stoneman House by fire forcibly impresses us with the fact that fire-proof construction should be used in the building which is to contain the generators and other expensive machinery incident to the electric light and power system.

The water-wheels should be of high-pressure jet type, directly connected to the alternating-current generators. The initial voltage of the generators should depend upon the length of the transmission line, which in turn would depend upon the location of the power-station. The use of multiphase alternating currents would be advisable, inasmuch as power will undoubtedly be an important adjunct to the electric lighting of the hotels and the floor of the Valley.

I would not advise the location of a search-light on Glacier Point. Any ordinary search-light would be insignificant in its effect when placed at such an altitude. The cost of conducting the current to the top of such a cliff would practically be prohibitive.

To light the hotels and drives in the Valley, and furnish power for general purposes, are the important uses to which the electrical energy should be put.

The cost of such a power and lighting system, ready for operation, I estimate to be about $15,000. This first cost of the plant, however, would not depend directly upon its size or capacity. Certain fixed expenditures, independent of the power developed, deserve consideration. Among these may be mentioned the power-house, hydraulic system, poles, and transmission line, etc. It seems desirable, therefore, to make an estimate of the cost of such a power plant, the maximum output at present to be the equivalent of 75 horse-power, the design, however, to be such that another 75 horse-power unit may be installed at any future time, if necessary, without great expense.

The above estimate, which is segregated below, is based upon these considerations. It should be borne in mind, however, that these are only preliminary, and the only method of securing an accurate estimate is to design the entire system, deciding on its location and the details of its construction. In order to secure the best results it would seem advisable to place the design and construction of such a plant in the hands of a consulting electrical and hydraulic engineer, who would report his plans to the Commissioners for their consideration. Definite information would then be at hand as to the cost of constructing such a system, including the exact location of the power-station and other details of construction.

Building	$2,000 00
Pipe-line	2,500 00
Water-wheel, 75 H.P.	350 00
Generator, 60 K.W.	2,100 00
Transmission line, estimated 3 miles	750 00
Construction of head works	1,000 00
Installation of entire system	2,500 00
200 incandescent lamps, 16 C.P.	400 00
Induction motors for power, four 20 H.P.	2,000 00
Transformers for entire system	800 00
Freight estimated	600 00
Total	$15,000 00

The annual cost of operating such a system would depend upon circumstances, but the important item would be attendance. The services of four men would probably be necessary. One of these should be a competent chief engineer, in charge of the entire system.

In conclusion, I wish to say that such a power-transmission plant in the Yosemite Valley should be a model central station, and be one of the places of interest in the Valley, showing how water-power may be utilized in the mountains of California and transmitted in the form of electrical energy to the centers of population.

CLARENCE L. CORY.

Electrical Engineering Laboratory, University of California,
BERKELEY, CAL., August 26, 1896.

YOSEMITE; DESCRIPTIVE AND HISTORICAL.

Yosemite Valley is situated in the heart of the Sierra Nevada, about 155 miles in a direct line nearly due east from the City of San Francisco. At this point, the range of mountains is a little more than 70 miles wide, and the Valley lies just midway between the east and west bases. To quote from the guide-book of the Geological Survey, published under authority of the Legislature, it is a nearly level area, about 6 miles in length, from half a mile to a mile in width, sunk almost a mile in perpendicular depth below the general level of the adjacent region, and through the center of which runs the Merced River. It may be roughly likened to a gigantic trough, hollowed in the mountains, nearly at right angles to their general trend. This trough is quite irregular, having several reëntering angles and square recesses, set back, as it were, into its sides. Still a general northeasterly direction is maintained in the depression, until we arrive at its upper end, when it turns sharply at right angles, almost, and soon divides into three branches, through either of which we may, going up a series of gigantic steps, ascend to the general level of the Sierras. Down each of these branches, or cañons, descend streams, forks of the Merced, coming down the steps in stupendous waterfalls. At its lower end, the Valley contracts into a narrow gorge, or cañon, with steeply inclined walls, and not having the U slope of the Yosemite, but the usual V form of California valleys.

The territory embraced by the Yosemite Grant comprises the whole of the Valley proper, and extends back from the edge of the precipice for an average distance of 1 mile. This covers an area of 36,111.14 acres. The Big Tree Grant, situated 12½ miles south of the Yosemite Grant, contains 2,589.26 acres, and the two combined aggregate 38,700.40 acres, or about 60 square miles. Although the Yosemite Grant covers a very extensive area, not less, in fact, than 56 square miles, very little—only about three per cent—of the tract can be made useful for any other purpose than that to which the Act of Congress has devoted it, namely, as a place for "public use, resort, and recreation." All the land extending back from the edge of the bluffs which form the limits of the Valley, is high, much of it exceeding 8,000 feet, and it is either very rocky or else covered with a thick growth of heavy timber, so as to render it entirely unfit for purposes of cultivation.

On the level of the Valley there are only 1,141 acres, of which 745 acres are meadow lands, and the remainder fern or high lands, requiring to be subdued and cultivated before they can be made available. Thus, only about two per cent of the whole grant can be regarded as arable.

From time immemorial, the Yosemite Valley has been regarded by the Indian tribes living on both the western and eastern slopes of the Sierra as a stronghold or place of refuge in time of trouble, as well as a spot where a large stock of acorns could be gathered for their winter food. In 1850 the settlers who lived on the streams which head in the region adjacent to the Yosemite, finding themselves unable to live in peace with the neighboring Indians, organized for their protection a military company, under Captain Boling, who, in 1851, pursued a party of these Indians that had been committing depredations in the lower foothills into the mountains and into the Yosemite, where they had taken refuge. On their return the party gave an account of this wonderful Valley, and others tried to find it that same year, but failed in their endeavors. In 1851 Captain Boling again went with some companions for the purpose of proving his assertions, and in 1853, Mr. Robert B. Stinson, then a resident of Mariposa, started out on a hunting expedition with a party of ten others, and in their wanderings in search of game, as well as out of curiosity, penetrated as far as the Yosemite, where they spent some time. In 1856 the regular pleasure travel commenced, which has continued ever since. As early as 1857, the Valley was resorted to by invalids and persons suffering from the great prolonged heat of the summer months in the towns of the lower foothills. These facts are mentioned in order to show that a trip to the Yosemite, even in those early days, was regarded as no hardship, but, on the contrary, was looked upon as a pleasure excursion, and sometimes undertaken by ladies in delicate health.

The first house was built in the Valley in the autumn of 1856, and occupied a portion of the ground where Black's Hotel stood until a recent period.

In the spring of 1858 the main building formerly occupied by Mr. Hutchings was erected by Hite & Beardsley, who kept it as a public house during that season. It afterward passed into the hands of Messrs. Sullivan & Cashman, of San Francisco, for a debt, as the Commissioners understand, but was still kept as a hotel from 1859 to 1861, by a Mr. Peck; afterward by a Mr. Longhurst; and between 1864 and 1875 by Mr. Hutchings.

Prior to May, 1864, the only actual settler and resident in the Valley was the late Mr. J. C. Lamon, who, since 1860, lived there uninterruptedly until his death in the spring of 1875.

Bridal Veil Falls.

Lower Yosemite Falls.

El Capitan.

FINANCIAL STATEMENT.

SHOWING RECEIPTS AND DISBURSEMENTS BY FUNDS FOR THE FORTY-SIXTH FISCAL YEAR.

Appropriation for Care of Yosemite Valley.

By appropriation		$10,000 00
Lumber	$86 10	
Freight	119 47	
Work on hotels	3,302 73	
Labor under Guardian	713 23	
Experting books	15 00	
Board of laborers on Sentinel Hotel	1,252 10	
Office expenses	975 35	
Repairing Pohono Bridge	674 00	
Work on roads	560 00	
Advertising	5 00	
Supplies	1,554 91	
Telephone and telegrams	64 61	
Horse hire in Valley	12 50	
Repairing buildings	665 00	
		$10,000 00

Appropriation for Care of Mariposa Big Tree Grove.

By appropriation		$2,500 00
Labor in Grove, on roads, clearing brush	$1,750 00	
Supplies	1 75	
Fighting fires	66 00	
Office expenses	682 25	
		$2,500 00

Appropriation for Traveling Expenses.

By appropriation		$1,500 00
Drawn for traveling expenses	$1,454 80	
Reverted to treasury	45 20	
		$1,500 00

Yosemite Fund.

Balance on hand, July 1, 1894		$269 42
By rent account		3,794 00
Sales in Valley reported by Guardian		129 31
Total receipts		$4,192 73
Lumber	$482 90	
Supplies	498 10	
Work on hotels	12 50	
Freight	537 96	
Labor in Valley	2,315 16	
Salaries	250 00	
Advertising annual meeting	16 00	
Rent of office	57 50	
Stationery, expressage, postage, and fuel	10 90	
		4,181 02
Balance on hand		$11 71

Résumé.

	Disbursements.	Receipts.
Appropriation for care of Yosemite Valley	$10,000 00	$10,000 00
Appropriation for care of Mariposa Big Tree Grove	2,500 00	2,500 00
Appropriation for traveling expenses	1,500 00	1,500 00
Yosemite Fund	4,181 02	4,192 73
	$18,181 02	$18,192 73
		18,181 02
Balance on hand from forty-sixth fiscal year (Carried over to credit of Yosemite Fund).		$11 71

SHOWING RECEIPTS AND DISBURSEMENTS BY FUNDS FOR THE FORTY-SEVENTH FISCAL YEAR.

Appropriation for Care of Yosemite Valley.

By appropriation		$7,500 00
Labor in the Valley	$3,148 32	
Office expenses	387 35	
Survey of floor of Valley	353 75	
Supplies	1,241 77	
Freight	299 89	
Lumber	1,624 00	
Board of laborers	388 14	
Experting books	15 00	
Horse hire in Valley	9 50	
Stationery, expressage, etc.	25 87	
Balance	6 41	
		$7,500 00

Appropriation for Care of Mariposa Big Tree Grove.

By appropriation		$1,250 00
Work in Grove	$500 00	
Work on roads	350 00	
Proportion of salaries and office expenses	313 60	
Supplies	47 55	
Balance	38 85	
		$1,250 00

Appropriation for Traveling Expenses.

By appropriation		$750 00
Traveling expenses to and from Valley	$146 05	
Balance on hand	603 95	
		$750 00

Yosemite Fund.

Balance on hand		$11 71
By rent account		3,401 00
By sales reported by Guardian		59 00
Total receipts		$3,471 71
Labor under Guardian	$1,678 15	
Office expenses	230 80	
Supplies	480 50	
Repair of roads	375 00	
Freight and hauling	296 03	
Advertising annual meeting	22 50	
Survey of floor of the Valley	18 50	
Miscellaneous expenses	13 60	
Balance	356 63	
		$3,471 71

Résumé.

	Disbursements.	Receipts.
Appropriation for care of Yosemite Valley	$7,493 59	$7,500 00
Appropriation for care of Mariposa Big Tree Grove	1,211 15	1,250 00
Appropriation for traveling expenses	146 05	750 00
Yosemite Fund	3,115 08	3,471 71
	$11,965 87	$12,971 71

Balance to credit of the appropriation for the care of Yosemite Valley	$6 41
Balance to credit of the appropriation for the care of Mariposa Big Tree Grove	38 85
Balance to credit of the appropriation for traveling expenses	603 95
Balance to credit of the Yosemite Fund	356 63
Balance of funds of forty-seventh fiscal year still in treasury at end of fiscal year	$1,005 84

APPENDIX.

OFFICIAL ACTS RELATING TO THE YOSEMITE LAND GRANT.

A *résumé* of previous reports shows that Congress passed an Act authorizing a grant to the State of California of the "Yosemite Valley" and the land embracing the "Mariposa Big Tree Grove," and that said Act was approved on the 30th of June, 1864, and is as follows:

SECTION 1. That there shall be, and is hereby granted to the State of California, the "cleft" or "gorge" in the Granite Peak of the Sierra Nevada Mountains, situated in the County of Mariposa, in the State aforesaid, and the headwaters of the Merced River, and known as the Yosemite Valley, with its branches and spurs, in estimated length, fifteen miles, and in average width, one mile back from the main edge of the precipice on each side of the valley; with the stipulation, nevertheless, that the said State shall accept this grant upon the express conditions that the premises shall be held for public use, resort, and recreation, and shall be inalienable for all time; but leases, not extending more than ten years, may be granted for portions of said premises. All incomes derived from leases of privileges to be expended in the preservation and improvement of the property, or the roads leading thereto. The boundaries to be established at the cost of said State, by the United States Surveyor-General of California, whose official plat, when affirmed by the Commissioner of the General Land Office, shall constitute the evidence of the locus, extent, and limits of said cleft or gorge; the premises to be managed by the Governor of the State, with eight other Commissioners, to be appointed by the Executive of California, and who shall receive no compensation for their services.

SEC. 2. *And be it further enacted*, That there shall likewise be, and there is hereby granted to the State of California, the tracts embracing what is known as "Mariposa Big Tree Grove," not to exceed the area of four sections, and to be taken in legal subdivisions of one quarter section each, with the like stipulation as expressed in the first section of this Act, as to the State's acceptance, with like conditions as in the first section of this Act, as to inalienability, yet with the same lease privilege; the income to be expended in the preservation, improvement, and protection of the property; the premises to be managed by Commissioners, as stipulated in the first section of this Act, and to be taken in legal subdivision as aforesaid; and the official plat of the United States Surveyor-General, when affirmed by the Commissioner of the General Land Office, to be the evidence of the locus of said Mariposa Big Tree Grove.

[*Chapter CLXXXIV of the Statutes at Large, passed at the Thirty-eighth Congress, session one.*]

As soon as possible after the news of the passage of the above Act was received in California, F. F. Low, then Governor, issued the following:

PROCLAMATION.

STATE OF CALIFORNIA, EXECUTIVE DEPARTMENT,
SACRAMENTO, September 28, 1864.

WHEREAS, The United States, by an Act passed at the first session of the thirty-eighth Congress, has granted to this State the territory comprising the "Yosemite Valley and the Mariposa Big Tree Grove," to be held and used for the purposes mentioned in said Act; and whereas, it is also provided in the Act, that the management and control of the tracts of land shall be confided to a Board of Commissioners, to be appointed by the Governor;

Now, therefore, be it known that I, Frederick F. Low, Governor of the State of California, by virtue of the authority in me vested, have appointed Fred Law Olmsted, Professor J. D. Whitney, William Ashburner, I. W. Raymond, E. S. Holden, Alexander Deering, George W. Coulter, and Galen Clark said Commissioners, to whom is confided the management of the aforesaid tracts of land. And I hereby warn and command all persons to desist from trespassing or settling upon said territory, and from cutting timber, or doing any unlawful acts within the limits of said grant.

All propositions for the improvement of the aforesaid tracts of land, or for leases, should be made to the Commissioners, through Fred Law Olmsted, Bear Valley, Mariposa County.

In testimony whereof, I have hereto set my hand, and caused the great seal of the State of California to be affixed, this twenty-eighth day of September, 1864.

[L. S.]

FRED'K F. LOW,
Governor of California.

Attest: B. B. Redding, Secretary of State.
By F. W. Redding, Deputy.

The surveys necessary to establish "the locus, extent, and limits" of the Yosemite Valley and the Mariposa Big Tree Grove, as required by the Act of Congress, were made in the autumn of 1864, by order of the Commissioners appointed by the above proclamation, under the direction of James T. Gardner, who was appointed United States Deputy Surveyor for that purpose.

The official plat of this work was forwarded by the Surveyor-General of California to Washington, and accepted by the Commissioner of the General Land Office.

Before, however, the Yosemite Valley and Mariposa Big Tree Grove could become the property of the State, it was necessary that the grant made by Congress should be accepted by the State Legislature. This was done during the session of 1865–66, when the following Act was passed:

An Act to accept the grant by the United States Government to the State of California of the Yosemite Valley and Big Tree Grove, and to organize the Board of Commissioners, and to fully empower them to carry out the objects of the grant, and fulfill the purposes of the trust.

[Approved April 2, 1866.]

Whereas, By an Act of Congress, entitled an Act authorizing a grant to the State of California of the Yosemite Valley, and of the land embracing the Mariposa Big Tree Grove, approved June thirtieth, A. D. eighteen hundred and sixty-four, there was granted to the State of California, in the terms of said Act, said valley and the lands embracing said grove, upon certain conditions and stipulations therein expressed; now, therefore,

The People of the State of California, represented in Senate and Assembly, do enact as follows:

Section 1. The State of California does hereby accept said grant upon the conditions, reservations, and stipulations contained in said Act of Congress.

Sec. 2. The Governor, and the eight other Commissioners, Frederick Law Olmsted, Prof. J. D. Whitney, William Ashburner, I. W. Raymond, E. S. Holden, Alexander Deering, Geo. W. Coulter, and Galen Clark, appointed by him on the twenty-eighth day of September, eighteen hundred and sixty-four, in accordance with the terms of said Act, are hereby constituted a Board to manage said premises, and any vacancy occurring therein from death, removal, or any cause, shall be filled by the appointment of the Governor. They shall be known in law as "The Commissioners to Manage the Yosemite Valley and the Mariposa Big Tree Grove," and by such name they and their successors may sue and be sued, and shall have full power to manage and administer the grant made and the trust created by said Act of Congress, and shall have full power to make and adopt all rules, regulations, and by-laws for their own government and the government, improvement, and preservation of said premises, not inconsistent with the Constitution of the United States or of this State, or of said Act making the grant, or of any law of Congress or of the Legislature. They shall hold their first meeting at the time and place to be specified by the Governor, and thereafter as their own rules shall prescribe, and a majority shall constitute a quorum for the transaction of business. They shall elect a President and a Secretary, and any other officers from their number, as their rules may prescribe.

Sec. 3. None of the said Commissioners shall receive any compensation for their services as such. They shall have the power to appoint a Guardian, either of their number or not, of said premises, removable at their pleasure, to perfom such duties as they may prescribe, and to receive such compensation as they may fix, not to exceed five hundred dollars per annum.

Sec. 4. The Commissioners shall make a full report of the condition of said premises, and of their acts under this law, and of their expenditures, through the Governor, to the Legislature, at every regular session thereof.

Sec. 5. The State Geologist is hereby authorized to make such further explorations on the said tract, and in the adjoining regions of the Sierra Nevada Mountains, as may be necessary to enable him to prepare a full description and accurate statistical report of the same, and the same shall be published in connection with the reports of the Geological Survey.

Sec. 6. It shall be unlawful for any person willfully to commit any trespass whatever upon said premises, cut down or carry off any wood, underwood, tree, or timber, or girdle or otherwise injure any tree or timber, or deface or injure any natural object, or set fire to any wood or grass upon said premises, or destroy or injure any bridge or structure of any kind, or other improvement that is, or may be, placed thereon. Any person committing either or any of said acts, without the express permission of said Commissioners, through said Guardian, shall be guilty of a misdemeanor, and on conviction thereof shall be punished by fine not exceeding five hundred dollars, or by imprisonment in the county jail not exceeding six months, or by both such fine and imprisonment.

Sec. 7. The sum of two thousand dollars is hereby appropriated for the eighteenth and nineteenth fiscal years, out of any moneys in the treasury not otherwise appropriated, to pay said Guardian and the incidental expenses of the Commissioners, and to be expended under the supervision of said Commissioners; *provided*, that not more than one half of said sum shall be expended during the eighteenth fiscal year.

Sec. 8. This Act shall take effect immediately.

[*Chapter DXXXVI of the Statutes of California, passed at the sixteenth session of the Legislature, 1865–66.*]

Sections 3584 to 3586 of the Political Code confirm the appointment of the Commissioners, and reënact all that relates to their powers contained in the above cited Act of the Legislature.

In 1866, Mr. F. L. Olmsted, one of the Commissioners originally appointed by Governor Low, resigned after returning from the East, and Mr. H. W. Cleaveland, of San Francisco, was appointed. Mr. Alexander Deering resigned in 1873, on being elected to the office of District Judge, and Mr. Edgar Mills, of Sacramento, was appointed. In 1875, Mr. George W. Coulter, resigned, and was succeeded by Mr. P. D. Wigginton, of Merced, who in his turn resigned after being elected to Congress, and his place on the Board was filled by the appointment of Mr. Thomas P. Madden, of San Francisco. Since then there have been a good many vacancies caused either by deaths, resignations, or expirations of terms of office.

RULES AND REGULATIONS.

Be it resolved, that the Rules and Regulations for the government of the Yosemite Valley and Mariposa Big Tree Grove be amended to read as follows:

I.

No person shall reside or transact business within the Yosemite Valley and Mariposa Big Tree Grant without permission from the Commissioners.

II.

No application or residence or privilege to transact business within the Valley or Grove shall be considered if the applicant be in arrears to the Commission. Applicants must be in good standing.

III.

Any person having permission to reside or transact business within the Valley or Grove, who shall transfer or sublet the whole or any part of the premises or business in said permit, without the written consent of the Commission, shall *ipso facto* forfeit the same.

IV.

The Guardian shall report to the Board all persons residing or transacting business within the Grant without permission, and shall cause the immediate discontinuance of such residence or business.

V.

No person residing or transacting business within the Grant shall retain in his or her employ any person who is detrimental to good order or morals.

VI.

Upon complaint made to the Commission by the Guardian against any person specified in Rule V, the employer of such objectionable person shall be notified of the facts, and the employé must be dismissed.

VII.

Any employer neglecting or refusing to dismiss such objectionable employé, shall thereby forfeit his or her permission to reside or transact business within the Grant.

VIII.

No person shall be employed as a Guide who has not a good moral character, and approved by the Guardian.

IX.

The Guardian shall, upon the complaint of any tourist or other visitor of the conduct or behavior of the Guide, inquire into the cause, and advise the complainant of the result, enforcing Rule V if necessary, and report same to Secretary.

X.

The Guardian has the power to suspend the Guide from his privilege during the investigation of the charges preferred against said Guide. If the Guide be found in fault, he shall be dismissed in accordance with Rule V.

XI.

The Guardian shall inspect all horses, trappings, and vehicles used for hire, and if any such horses, trappings, or vehicles may be deemed unsuitable or unsafe by him, he shall cause the same to be removed at once from the Valley or Grove.

XII.

Any person offering for hire or otherwise any horse, mule, trapping, or vehicle, or refuses or neglects to remove the same from the Grant, after the Guardian shall have condemned the same, shall forfeit his privilege to reside or transact business within the Grant.

XIII. (Rescinded.)

XIV.

The Guardian shall direct campers to the grounds set apart for their use within the Grant, and shall establish such rules as will contribute to their comfort.

XV.

Campers upon entering the Valley must go to the office of the Guardian and enter their names and residence upon the register there provided. This rule shall be printed and placed in some conspicuous position, so that campers will not fail to see same upon entering Grant.

XVI.

No campfires shall be permitted within the Grant, or either Valley or Grove, without the express permission of the Guardian.

XVII.

No trees shall be cut or injured, or any natural object defaced.

XVIII.

The discharge of firearms within the Grove or Valley is strictly prohibited.

XIX.

No horses, cattle, or stock of any kind shall be allowed to run at large within the Grant, except on permission given in writing to the owner or owners thereof. Campers and all others, save those holding a license from the Commission, are prohibited from hiring their horses, trappings, or vehicles to tourists or visitors within the Grant.

XX.

No person shall drive or ride faster than a walk over any of the bridges.

XXI.

The Guardian shall promptly cause the arrest of any person violating Rules XVI, XVII, XVIII, XIX, and XX, and prosecute the offender or offenders to the full extent of the law, under section six of the Act of April 2, 1866, as found in the last division of this book.

XXII.

No lessee of any hotel in the Yosemite Valley shall, within the limits of the Grant, by himself, clerk, or agent, directly or indirectly, solicit, invite, or ask any person to patronize his hotel.

XXIII.

Every driver of public conveyances shall, upon arrival of same at any hotel, announce the name of said hotel to his passengers, but he shall do no more than state the name of the hotel, and shall not in any way seek to influence any passenger in the selection of the same.

XXIV.

Rates of charges at hotels, and also for horses, trappings, and vehicles, or for provender, as published by the Commission from time to time, must not be exceeded, under pain of forfeiture of privilege to keep a hotel or conduct a livery business or to sell provender.

XXV.

The Guardian shall notify the lessee of hotels of any action of the Commission, forbidding any objectionable persons from residing or transacting business in the Valley or Grove.

XXVI.

The Guardian shall, from time to time, enter all tenements for the purpose of inspecting the sanitary condition, and examining all property in pursuance of his official duties.

XXVII.

No building or improvement of any kind shall be erected or made upon the ground without the written authority from the Commission.

XXVIII.

All buildings and improvements of every kind, erected or made upon the Grant, belong to the Grant, and shall be so recognized and treated.

XXIX.

The Guardian shall exercise general police supervision in the Valley and Grove, and shall forbid and prevent all acts that tend to a breach of the peace, for the discomfiture of visitors, or injury or destruction to property.

XXX.

The Guardian shall, upon the first day of June of each year and running thereafter until the first of October, appoint one or more persons who shall act as patrolmen in the Grant.

XXXI.

The salary of the patrolmen shall be fixed by the Board.

XXXII.

It shall be the duty of the patrolmen to visit the camps, see that the campers have been registered in the office of the Guardian, take a note of the condition of the camp, take a note of all complaints, and perform such other duties as the Guardian may state for him, and report in writing every day to the Guardian the result of his rounds.

XXXIII.

There shall be no pooling of the hotels, stage lines, or other concessions granted by the Commission; and, it being ascertained by the Commission that such rule has been broken, the said concession shall be forfeited.

XXXIV.

All leases for any privilege or concessions exceeding the sum of $100 per annum, shall be open to competition, and the Secretary is instructed to advertise for sealed bids sixty days prior to the expiration of said concession, and to invite bids upon the same; and all bids must be accompanied by sufficient guarantees that the contract shall be carried out by the bidders to the satisfaction of the Board. Said advertisements must be published in one Mariposa County paper and in one San Francisco paper. The Board reserves the right to reject any and all bids.

XXXV.

The Guardian shall make no changes, nor shall he incur any liability without specific authority, and he must refer all questions of policy touching the management of the trust to the Board for its discussion. He must promptly remit all collections to the Secretary and Treasurer, and is especially forbidden to disburse any funds of the Commission, unless directed so to do by the Board. His vouchers must be full and self-explanatory, and must be taken by him in triplicate; one must be retained in his office in the Valley, and the other two to be transferred to the Secretary and Treasurer. His accounts covering the last month past shall be made out by him and forwarded to the Secretary on the first of each month. He shall also transmit to the Secretary his estimate of labor and materials, and await the approval of the same before purchasing or ordering the same. No standing timber shall be cut without special authority in writing from the Board. He must, at the close of the season, and during the month of March of each year, if possible, report the condition of the State property, and what repairs and changes he deems necessary, together with the estimated costs thereof.

He may in case of emergency use his discretion in incurring indebtedness without the order of the Board, the same to be subject to the approval thereof, however, not exceeding the sum of one hundred ($100) dollars.

XXXVI.

The Secretary shall have printed a copy of such of the above rules as will best subserve good order within the Grant. He will also embody with the said rules a list of the trails in the Valley and distances, and charges for saddle and vehicle hire over the said trails and roads, hotel rates for board and lodging, and such information as will benefit the traveling public. The Guardian shall provide each visitor with a copy of the above rules.

BY-LAWS.

ARTICLE I.

The principal place of business of the Board of Commissioners shall be in the Yosemite Valley. They shall meet in the Yosemite Valley on the first Wednesday of June in each year, and shall thereafter hold regular meetings in San Francisco on the second Monday of each month. Three Commissioners shall constitute a quorum at all regular monthly meetings.

ARTICLE II.

The Governor of the State of California is the President of the Board.

ARTICLE III.

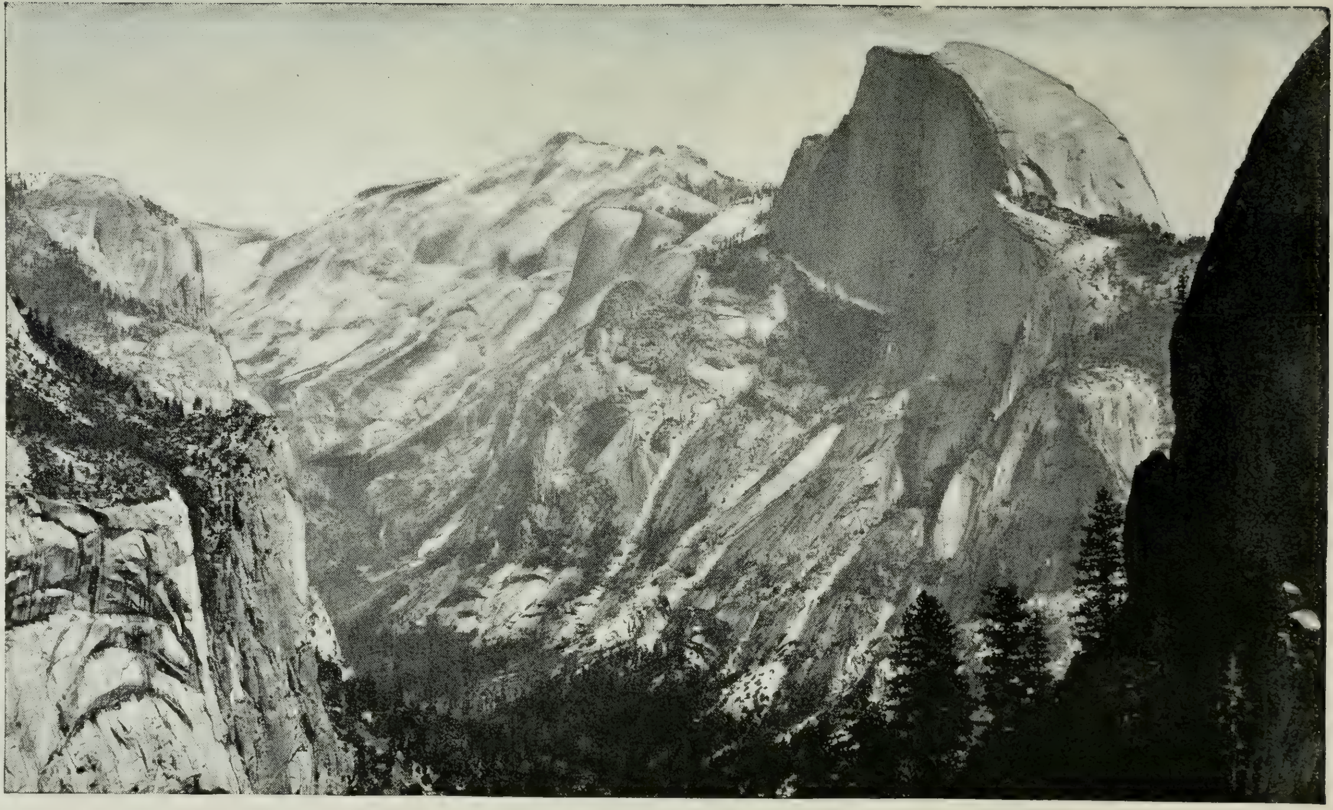
The other officers of the Commission shall be a Vice-President, and Secretary, who shall also be Treasurer. These officers shall be elected by ballot. The President shall also appoint, as permanent committees, a committee of two on Trails and Bridges, a committee of two on Tenements and Buildings, a committee of two on the Preservation of the Valley, a committee of two on Complaints and Petitions, and a committee of three on Finance and Accounts. These several committees shall hold office for one year, or at the discretion of the President. They shall visit the Valley at least once a year and report on the conditions found therein at the July meeting of the Commission.

ARTICLE IV.

It shall be the duty of the President to preside at the meetings of the Board, and perform such other duties as properly appertain by usage to the office of President.

ARTICLE V.

In case of the absence of the President, or of his inability to serve, the Vice-President shall perform his duties.



Half Dome and Cloud's Rest.

ARTICLE VI.

The Secretary shall keep a record of the proceedings of the Commission in properly prepared books, to be provided for that purpose; shall conduct the correspondence of the Commission, making letter-press copies of all official letters written by him, and properly file all communications which he may receive as Secretary of the Commission, or which may appertain to its business, and give an account of his correspondence whenever required by the Board of Commissioners, and during business hours the same shall be open to inspection by any individual Commissioner. He shall also keep a record, in the minute book, of all votes obtained by correspondence, and all votes given by Commissioners in that way shall have the same effect as though cast in the general way. He shall also attend to all matters of the Board, and perform such clerical duties as may be required of him. As Secretary and Treasurer it shall be his duty to keep a record of the finances and transactions of the Board, covering all circumstances, accounts of all sources of revenue, including all appropriations made by the State of California, making proper record of each several items, and transmit all moneys received for or on account of rents, privileges, or any other source, to the State Treasurer, in accordance with law. He shall make up vouchers from the monthly report of the Guardian of the liabilities for wages of laborers employed in the Yosemite Valley and the Mariposa Big Tree Grant, and also for supplies and materials purchased by him from month to month, and, upon such vouchers being approved by the Finance Committee, transmit the same to the State Controller for payment. Such vouchers to be made payable to the Secretary and Treasurer of the Board of Commissioners, the better to enable him to keep a correct record of all disbursements. And he shall, upon receipt of the Controller's warrant, apply the proceeds of said warrant to the payment of the various sums to the several claimants covered by such warrants. His account of moneys received and disbursed shall be explicit and full; and whenever legally called upon to do so, shall deliver up the moneys, books, papers, and other property of the Commission in his hands to his successor in office, or to such other person as may be designated by the Board to receive the same. He shall obey the orders of the Board, and render such services as may be required of him, relating to the Treasurer, and shall at all times, during business hours, open his books and expose his papers to any individual Commissioner upon request.

ARTICLE VII.

The regular meetings of the Board held in San Francisco shall be for the purpose of hearing the report of the Guardian, of the committees, and for auditing and allowing bills, ordering work, and transacting such other business as may properly come before it. Special meetings may be called at any time, and shall be so called on request of two or more Commissioners.

ARTICLE VIII.

It shall be the duty of the Finance Committee to have general supervision of the finances. It shall audit all bills before their presentation to the Board, and perform such other duties as are usually performed by such bodies. It shall carefully inquire into the revenues of the Commission, the source thereof, and changes therein. No expenditures of any amount to exceed $300 shall be made except upon order of the Board in open meeting. This must not apply to such emergencies as will prevent the Guardian from communicating with the Board.

ARTICLE IX.

Section 1. A majority of the Board only is empowered to issue residence or business permits, as that entitles the holders thereof to transact business in the Valley or Grove. They shall adopt the form of such permits. Permits shall not be issued for a longer term than one year, but may be issued from year to year, or from month to month. They shall recite the business of the holder, and specify the tenement or locality for occupancy. Permits shall be revoked upon the violation of any of the rules of the Commission. Permits shall be issued to only persons of good moral character, upon the consent of the Board, and signed by the Guardian, the President, Vice-President, and Secretary.

Sec. 2. The Board of Commissioners shall establish the rates to be charged for hotels, the rates for carriage and horse hire, the rates for the sale of provender, and generally regulate the prices to be charged by all persons transacting business in the Valley or Grove.

ARTICLE X.

The President of the Board is an ex officio member of all committees. Such other committees, from time to time, as are necessary, shall be appointed, as at present.

ARTICLE XI.

In case of a vacancy by death, resignation, or removal from the State, or by any other inability to serve, on the part of the Vice-President, Secretary and Treasurer, the President shall appoint some one to the place.

YOSEMITE VALLEY AND MARIPOSA BIG TREE GROVE

This trust, created by Act of Congress on the 30th of June, 1864, has since been managed by the following Commissioners, the Presidents of the Board successively heading the list:

PRESIDENTS:

Governor F. L. LOW.
Governor H. H. HAIGHT.
Governor NEWTON BOOTH.
Governor ROMUALDO PACHECO.
Governor WILLIAM IRWIN.
Governor GEORGE C. PERKINS.
Governor GEORGE STONEMAN.
Governor WASHINGTON BARTLETT.
Governor R. W. WATERMAN.
Governor H. H. MARKHAM.
Governor JAMES H. BUDD.

COMMISSIONERS:

Fred Law Olmsted.
J. D. Whitney.
William Ashburner.
I. W. Raymond.
E. S. Holden.
Alexander Deering.
George W. Coulter.
Galen Clark.
Henry W. Cleaveland.
Wm. C. Priest.
Edgar Mills.
P. D. Wigginton.
Thomas P. Madden.
F. M. Pixley.
Jno. P. Irish.
Jos. G. Eastland.
George B. Sperry.
Charles G. Clinch.
Henry K. Field.
Wm. H. Mills.
I. W. Taber.
M. C. Briggs.
J. P. Jackson.
George S. Ladd.
A. J. Meany.
James L. Sperry.
Charles L. Weller.
John Boggs.
Miles Wallace.
J. M. Griffith.
J. H. O'Brien.
Jonathan Mentzer.
E. W. Chapman.
William B. May.
George G. Goucher.
Ben C. Truman.
M. H. Hecht.
John F. Kidder.
T. S. C. Lowe.
Max Goldberg.
E. P. Johnson.
H. J. Ostrander.
Chas. S. Givens.

TWENTY-FOURTH ANNUAL REPORT

OF THE

BOARD OF PARK COMMISSIONERS

OF

SAN FRANCISCO,

FOR THE YEAR ENDING JUNE 30, 1895.

SACRAMENTO:
A. J. JOHNSTON, : : : : : : : SUPERINTENDENT STATE PRINTING.
1895.

PARK COMMISSIONERS.

JOSEPH AUSTIN, President.
IRVING M. SCOTT.
JOHN ROSENFELD.

John McLaren	Superintendent.
V. V. Bloch	Secretary.

Office of the Commissioners of Golden Gate Park,
Buena Vista Park, Mountain Lake Park,
San Francisco, Cal., July, 1895.

To His Excellency James H. Budd, *and to the Legislature of the State of California, and the Honorable Board of Supervisors of the City and County of San Francisco:*

Gentlemen: The Park Commissioners herewith present a report of their management of the grounds under their charge for the year ending June 30, 1895.

JOSEPH AUSTIN,
JOHN ROSENFELD,
IRVING M. SCOTT,
Park Commissioners.

REPORT OF PARK COMMISSIONERS.

In presenting our twenty-fourth report, we point with a just sense of pride to the continued improvement and development of the people's great pleasure ground; but at the same time, we cannot refrain from placing on record our deep sense of the irreparable loss to the park's best interests in the death of W. W. Stow, President of the Board, and our profound regret that he was not spared to carry out the many projects he had in view for the further enhancement of its many beauties.

THE LAKE EMBANKMENT.

During the past fiscal year, many improvements were effected in the park, not the least being the completion of the embankment around Stow Lake. As showing the extent of the work, thirty thousand cubic yards of sand were used. There is now a drive twenty-five feet wide around the entire embankment, a distance of about half a mile. The completion of this drive has added materially to the attractiveness of the lake. On pleasant days there is a steady procession of vehicles of every description on it, thus showing how keenly it is appreciated by the citizens who prefer that means of locomotion. At every turn they see something to delight the eye and rivet the attention. The interests of pedestrians have not been overlooked, as a path has been built from D Street and Seventeenth Avenue to the Boat House.

RECREATION VALLEY.

The Midwinter Fair was not an unmixed blessing. It left that portion of the park in a deplorable state. The borders of the walks and driveways in the vicinity of the north entrance to the Fair Grounds were trampled out of shape, and all had to be spaded up, manured, loamed, re-seeded, and thoroughly overhauled as far as the "cut". The reconstruction of Recreation Valley was a work of considerable magnitude. Work was commenced by plowing up the macadamized bicycle track, and the cinder running tracks that encircled the valley. This was followed by the work of regrading, the rock from the macadamized roadways built by the fair people being utilized. Then the ground was covered with loam to a depth of about eight inches, which had to be loaded into wagons and in some cases hauled a considerable distance. After hauling the rock from the old bicycle track and from the driveway surrounding the grand stand and the festival hall building, trenches were dug and water-pipes laid. Over nine thousand feet of water-pipe, varying in diameter from six to one and one half inches, were required. A six-inch main was laid along the middle of the valley, with two-inch branches one hundred feet apart, and hydrants placed at intervals of one hundred feet, so that with fifty feet of hose any portion of the track can be irrigated. Along the South Drive a four-inch main was put in, which has also two-inch branches that were laid to meet the branches from the six-inch main. It took two months of constant work with sixty men and twelve teams to put the ground in a condition fit for seed sowing. Owing to the tramping and digging of the fair people it was a tremendous piece of work, considering the size of the ground improved. Now what a change is there! The valley is one of the most charming spots in the park and forms a pretty picture surrounded with belts of trees, giving the valley perfect protection from the prevailing winds. These belts are fringed with groups and single specimens of handsome trees, which give variety and intricacy to the outline, and is unquestionably the finest piece of landscape in the whole park. The valley, as its name implies, will be used for recreation purposes, for which it is admirably adapted.

MUSEUM GROUNDS.

The ground surrounding the new museum building was put into shape. Considerable time and labor were occupied in hauling away rock, leveling the sand down to grade, hauling in soil and manure, laying water-pipe, and making the ground ready for the grass seed and shrubbery, etc.

THE SETTLING RESERVOIR.

An important feature of the year's work was the construction of the settling reservoir at the pumping-station. Sixty men and six teams were engaged in the work of scraping the sand and digging to a depth of thirty feet, besides putting in the planking and bracing. Enough water was procured to keep the two pumps supplied, pumping their full capacity of sixty thousand gallons per hour. Thirty men were afterward engaged for some weeks in shaping and grading the terrace ground at the pumping-station, digging holes and filling with loam and planting the trees.

LAYING WATER-PIPE.

About the middle of October work was commenced on the laying of the new water-pipe on the Main Drive west of the hill. Work was commenced at its junction with the east entrance to the "Speedway" and carried along the north line of the drive for the distance of about a mile. About three thousand feet of three-inch pipe and two thousand feet of four-inch pipe were used, the necessary tees and hydrant branches being put in at a distance of one hundred feet apart. During the month of March eight men were employed on the laying of water-pipe in different parts of the park. About five thousand feet of pipe were laid; the pipe varying in size from six to one and a quarter inches, but mostly of three- and four-inch and laid along the drives west of Strawberry Hill. In May considerable water-pipe was laid, mostly in the vicinity of the Deer Park. A four-inch pipe was laid along the drive south of the deer paddock, and two-inch branches were laid inside the inclosure for carrying water to the newly planted trees in several groups on the southerly slope.

FENCING.

During the months of December and January a fence was constructed the entire distance from Third Avenue to Twenty-fifth Avenue. The picket part is four feet high, and on the top of the pickets two barbed wires were strung, making the entire height of the fence six feet. On the north side of the park work was commenced at Seventh Avenue running along to Twenty-fifth Avenue. D Street was also fenced from Sixth Avenue east to Stanyan Street to Hayes Street, and planted with trees, giving a good finish to the park line. From Seventh Avenue west to Nineteenth Avenue along the line of D Street a hedge of acacia was set out and in the vacant spaces trees and shrubs of different species were planted, which, with the fence, made a nice finish to that line. Considerable grading had to be done between Seventeenth and Nineteenth Avenues, over five thousand yards having to be removed to give the ground a practical shape.

WIDENING AND REPAIRING DRIVES.

The widening of the main driveway in the vicinity of the watering box was performed in the months of March and April. There was a very heavy embankment to be moved back about six feet for a distance of about two hundred yards. This sand was hauled and used in widening the road at a narrow point a little farther to the east on the same road. The middle drive west of the Buffalo Park was also widened in May as far as the road leading to the lake. Considerable work was necessary to take up the macadam where the roadbed was badly shaped. The curves of the road were also very faulty, and had to be changed to put them in proper shape. Besides these improvements the South Drive was extended from Strawberry Hill to about Fortieth Avenue, a little over a mile long. A new piece of drive was also constructed around the group of pines west of Broom Point, forming an island and adding a touch of picturesqueness to the drive. Seven teams and thirty men were engaged for about a month in the dressing and repairing of the Main Drive from Baker Street to the flag-poles, and on the South Drive from the flag-poles to the Fair Grounds fence, opposite Sixth Avenue.

THE BICYCLE ROAD.

Your Commissioners, recognizing the fact that the park is for the use of the general public, and always desiring to make it as attractive as possible to all classes, decided to construct a driveway exclusively for bicyclists. In this decision we were largely guided from the danger of collisions or runaways, the wheel being an innovation and liable to frighten horses. The road selected and completed in April runs from Broom Point west for a mile, and parallels the Main Drive. In the construction of the road difficulties had to be overcome which entailed considerable work. The cuts and fills were rather heavy, some being as much as fifteen feet. In several places the old roadbed had to be picked up, the macadam removed, and the rock replaced by other material suitable for tree growing. A border averaging five feet wide, dividing the Main Drive from the bicycle road, was shaped and planted with different varieties of suitable trees and shrubs. Water-pipe, with hydrants, was laid down along the entire length of the road, so that the plants can be cared for properly with water. Goosenecks were also set up for filling the water-carts used in sprinkling the drives, thereby saving hauling such long distances as in former years. The sand for the grading of the bicycle track was taken from the bank on the north side of the Main Drive and moved to the south side. This encroachment on the bank left sufficient space for a footpath, which was shaped and properly finished. There is now the footpath on the north, the Main Drive in the center, and the bicycle road on the south, all paralleling one another. This is probably the only road constructed for the use of bicyclists in any park on the continent.

THE GREAT HIGHWAY.

The necessity of constructing the boulevard on the Great Highway which commences at the foot of the Cliff House hill and runs, facing the ocean, to the county line, a distance of three miles, has always been apparent. The lack of funds was, however, a stumbling block in the way, but last year a start was made and one mile constructed. It required considerable grading and shaping to get the boulevard ready for the rock, and men had to be kept at work ahead of the teams filling in hollows and cutting down what was above grade so as to give the roadway the proper crown and shape. The first coating of rough rock had to be broken, leveled, and rolled to be ready for the second layer. The macadamizing was finished for the mile in January, thus adding that distance to the park drives. Beginning at a point where the rock was spread, a gang of men was then set to work planting beach grass south to where the highway joins the Mission road, with the object of collecting sand for the required grading of the remaining distance next year.

LOAM.

During the year twenty-three thousand yards of loam were brought by cars from San Mateo County, and five thousand yards hauled by wagons from the neighboring hills. The loam from San Mateo was unloaded all along the south boundary of the park from Eighteenth Avenue west to the beach, the other being used in and around Recreation Valley.

STREET SWEEPINGS.

After persistent efforts, a part of the street sweepings of the city has, since January, been delivered at the park and distributed to the best advantage. A large quantity was spread in the vicinity of the Mechanic Arts Building site, and put on about six inches thick over the entire surface of the ground. The necessity of giving the park as large a share of the street sweepings as possible cannot be too strongly urged. How much better it is to improve the people's own pleasure grounds with them than to throw them into the bay and incur the expense of having later to dredge them out again. The lawns, the trees, and the flowers in the park will get renewed life and vigor from them, as they are composed of soil, sand, and manure. Besides, they are essential in the reclamation and permanent improvement of acres of sand all over the park.

PLANTING AND THINNING TREES.

The planting of trees was done, whenever the opportunity offered, in different parts of the park. In many places much labor was necessary to prepare the ground. The thinning of trees in forests also occupied considerable time and attention.

BUENA VISTA PARK.

Improvements were also effected in Buena Vista Park. The sidewalk along the park was cleared off. The clayey material was hauled into vacant lots near Haight Street.

HUNTINGTON FALLS.

The run on the upper portion of Huntington Falls was changed so that the upper fall could be seen from the Main Drive, which is a decided improvement.

SETTEES DONATED.

The Executive Committee of the Midwinter Fair, on December 1st, made a donation to the park of eleven hundred settees. As they were rather bare of paint, men were set to work repainting them. They were then distributed, the better shaped ones east of Strawberry Hill, where the greatest number were needed, and the others in convenient places west of the "cut." They were thankfully received, as they were very much needed.

MINERALS FOR THE MUSEUM.

At the close of the fair a considerable collection of minerals was donated to the museum from the different mining exhibits, which now forms part of the permanent exhibit in the Museum Building.

MEMORIAL MUSEUM.

The Memorial Museum is now one of the most attractive features of the park. It is visited by hundreds of people every day, and on Sundays the number is increased to thousands, who derive great pleasure and instruction from an examination of its interesting contents. The museum was formally turned over to your Commissioners on Saturday, March 23d, by M. H. de Young, the Director-General of the Midwinter Fair, in the presence of nearly three thousand people. In the course of his speech Mr. de Young said: "It affords me great pleasure to announce that we have not expended all our money; that we still retain a balance, and that it is the purpose of the Executive Committee to expend this in securing various collections from time to time to add to that which we offer for your inspection to-day. I now come to the pleasant part of the duty. Gentlemen of the Park Commission, the Executive Committee directs me to place to-day in your hands and in your keeping the Art Building and its annex, with their contents, for the use of the city and State. In placing these in your charge, we express the hope that they will always be open—Saturdays, Sundays, and holidays, and at all times—for the education and amusement of our citizens. Mr. Austin, in formally making this transfer, I present to you a key made from the golden metal that once rested in the bosom of our State. While it is a key which now unlocks buildings that cover scarcely two acres of ground, I would express a sincere hope that before it becomes your official duty to give up the same the buildings will cover over ten acres, and instead of possessing from five thousand to six thousand exhibits, as they do to-day, there will be half a million."

Mr. Austin, in accepting the key on behalf of your Commissioners, expressed his pleasure that the State had come into so valuable a possession, and said: "In the name of the Park Commission, and for the people of San Francisco, I accept the Memorial Museum, assuring the officers of the Executive Committee of the California Exposition that it will be our pride and pleasure, as Commissioners, to maintain the museum, to add to its value, and to make it one of the greatest in the world. The interior of the annex is very attractive, not alone in its contents, but in its arrangement and decoration. A portion of the building is devoted to a faithful reproduction of the Royal Bavarian pavilion, with its vaulted ceiling and frescoed panels set in heavy gilt frames. The Saurermann room, with its fine hardwood carvings and its distinctively Teutonic tone, is also a very attractive feature. Ceramic Hall contains some very fine pottery, representing many of the most famous wares. In the armor room there is a fine collection of armor worn by the knights of old. In the main building there is much that is interesting and instructive. The collections are subdivided under the names of the countries from which they came. The United States, Great Britain, France, Germany, Spain, Italy, Austria, Denmark, Sweden, Holland, Central American States, Papal States, Australia, Iceland, and other countries are thus represented. The Oriental room is an attractive feature. A collection of interesting relics, contributed by Wells, Fargo & Co., of the stage days of '49, commands more than usual attention from visitors. The bronze and other statuary, busts of prominent personages, and other works of art are instructive. In the ship-model department, Mr. Irving M. Scott, one of the Commissioners, has contributed some magnificent models. Another handsome model was contributed by Mr. Joseph Macdonough. Upstairs is the natural history department, and a finer collection of preserved birds, fishes, animals, and insects is not to be found anywhere. Here also are to be seen specimens of the minerals and woods of California. In front of the building is an exquisite piece of bronze statuary representing the 'cider press.' Facing the entrance is the magnificent Doré vase, in bronze, and at each side are two groups of bronze statuary, representing the four seasons."

Both the main building and the annex are filled to their utmost capacity, so generous have the citizens been in their donations, and it is imperatively necessary that another annex should be built. A wealthy resident of the city has offered for exhibition in the museum a fine collection of oil paintings, which has been gathered from the best galleries of Europe during the past twelve years, but the lack of room to show off the paintings to the best advantage has prevented the acceptance of this generous offer. Another case is that of Mrs. Oscar Elhard, a former resident of this city, now living in Guadalajara, Mexico, who has sent to the museum a valuable collection of Toltec and Aztec idols.

The collection numbers one hundred images in stone, taken from the ruins at Soldad, in the State of Vera Cruz, and from the former site of an Aztec temple at Otumba, thirty-five miles from the City of Mexico. For the want of space, this collection has been set up in the Spanish room, which already contains many things not connected with Spanish history. The most valuable collection of Alaskan relics in existence is owned by the Alaska Commercial Company of this city, which has been offered to your Commissioners, but cannot be accepted till space is provided by the erection of a new annex. When a new annex is built the exhibits will all be rearranged. From the lack of space, extensive examples of California products had to be placed in the natural history department, and there are other instances of a similar nature. The idea of your Commissioners is to keep the departments separate and exclusive for collections belonging to each particular department.

THE LATE W. W. STOW.

In the death of W. W. Stow, President of the Commission, on February 11th, the park lost one of its greatest friends and most ardent lovers. He was appointed a member of the Commission in 1889, and from that time until his death he took a keen, personal interest in everything pertaining to the development of the park. He was constantly planning to develop and improve the place, and spent as much of his time there as he could possibly spare from his other business. The park was his hobby and no business engagements could keep him away from it in the afternoon, no matter what the state of the weather. He loved the work and labored unceasingly and unsparingly at it. Every dollar voted to its improvement was religiously applied and with the view of securing the best results. His great hobby was the lake which bears his name, and it was the first big improvement he took an interest in after being elected President. In the beginning it was designed as a reservoir, which was badly needed from the fact that if the pumps broke down the small reservoir could not supply water for more than a day or two. The plan was for a reservoir on the east side of Strawberry Hill, and when that was finished it occurred to him to make it an ornamental sheet of water; a lake answering the purpose of a reservoir as well. He watched the work very closely from day to day until it was completed, and the compliment of naming it after him was richly deserved. Concert Valley was selected by him as the best place for a music concourse. He built the new waterworks, and had elaborate plans for improving the ground between the Aviary and Strawberry Hill and the forest west of the hill. When the water company was allowed to lay a main on Stanyan Street, across the panhandle, he made them give twenty-five thousand yards of loam to the park for the privilege. He got a four-inch water-pipe laid from the Almshouse when an artesian well was dug there, and so secured a large supply that enters the lake without pumping. He was beginning to take a great interest in forestry in the trees in the park; thinking of an oak grove and adding to the collection of native trees, pines, cypress, fir, oak, juniper, and others from the Sierra. Another of his schemes was to get a herd of mountain sheep for the park. The idea was to turn them loose in a large paddock at the rocks near the prayer-book cross. Trails were to be cut in the face of the rocks, where the wild sheep could be seen climbing and jumping like they do in the mountains. These and many other things he executed and planned for beautifying and developing the park. Many visitors to the park will bear green in their memory the man of commanding presence and fine physique who did so much to make it a thing of beauty and a joy forever.

The Commissioners, on April 10th, being their first meeting after his death, adopted the following resolution, which was suitably engrossed and presented to his widow and family:

WHEREAS, At this present meeting the Park Commissioners become officially cognizant of the death of its President, W. W. Stow, whose long and valuable services merit the highest recognition; therefore, be it

Resolved, That in recording the inscrutable decree of a Divine Providence this Board feels that to his able, just, and unwearying administration of the affairs of the park during the years of his commissionership are due in great measure the many permanent improvements executed during the past six years, and which, especially the lake bearing his name, will remain the best monument to his memory.

His wisdom as a counselor, his amiability as a gentleman, and his worth as a citizen will enshrine his name in the memories of all who enjoyed the privilege of his sterling friendship.

He was averse to notoriety, but had an intense, though modest, appreciation of those who placed a proper estimate on public services honestly rendered. Kind, gentle, and courteous in his intercourse with all, he was a true, high-minded man, a genial, earnest lover of justice, whose sense of duty was his guide and the limit of his action.

This Board tenders its sincere and respectful sympathy to the relatives of its late President in their irreparable loss, and orders that these resolutions be spread upon the minutes of this Board, and that a copy thereof, suitably engrossed, be forwarded to the bereaved widow and family.

THE PARK AS IT IS.

An eminent writer has said, "If we believe the Scripture we must allow that God Almighty esteemed the life of man in a garden the happiest he could give him, or he would not have placed Adam in the Garden of Eden." And so gardens have been spoken of by poets and historians of all ages as the sources of pleasure and the evidences of refinement; and many a man, weary of the turmoil of statesmanship and the whirl of business, has turned aside to find substantial enjoyment in the beauties of nature as therein set forth. We read many praises of the gardens of antiquity, and of the men who created them, but though some of the old pleasure grounds were, perhaps, more pretentious than any we now have, especially in their artificiality, we may well doubt if any of them were equal, on the whole, to those of our own time. New York takes an honest and just pride in her Central Park, Philadelphia in her Fairmount Park, Brooklyn in her Prospect Park, and so does San Francisco in her Golden Gate Park. It is doubtful whether, on the whole of this broad continent, there ever was a site reserved for public pleasure grounds of a more unpromising nature than that reserved for our public park. Twenty-five years ago, when the first Commissioners were appointed, the site was nothing but a succession of sand dunes, with long reaches of sand cliffs. The task before them was enough to make the stoutest heart quail, as it seemed utterly impossible to reclaim a desert and convert it into an attractive pleasure resort. But with a wonderful amount of faith they put their shoulders to the wheel, and now mark the result. For seventeen years the good work was carried on amid difficulties and discouragements, caused, not only by the barrenness of the soil, but by the lack of funds. With your Commissioners it has been a labor of love, and they have felt themselves fully rewarded by the confidence reposed in them, and the fact that the park has become a favorite haunt of thousands of people, whose tastes have been cultivated, and their mental, moral, and physical growth stimulated thereby. It is a fact that several thousand resort to the park habitually—some, daily, before and after business, and women and children at regular hours during the day. The aim of the Commissioners has been to make the park attractive for all classes of the community, and if their efforts were met with a more liberal spirit in the matter of funds for carrying out much-needed improvements, the park would soon be without a peer on this continent in beauty, picturesqueness, and variety of scenery.

The park is full of delightful surprises; exquisite bits of color that suddenly and unexpectedly come into view to charm the eye and elevate the mind. Trees and plants indigenous to the soil of many countries are there: The Australian tree fern; New Zealand tea tree and "toute," the latter bearing a fruit, by eating which cattle are driven crazy; the Passion vine from Cypress, Himalaya rhododendrons, Cedar of Lebanon, Norway spruce, Scotch broom, Eastern berberry, Douglass fir, the juniper tree, Oregon pine, Chinese trees, Eastern elms, maples, and basswood, plants from Japan, South America, Chili, South Africa, Southern Spain, Australia, New Zealand, and other countries too numerous too mention.

The park does not have its river running through its midst like Fairmount Park in Philadelphia, but it has its beautiful artificial lake and its magnificent waterfall—the only artificial waterfall in a public park on the continent—which excites the wonder and admiration of strangers and citizens alike.

No grander or more sublime view of natural scenery can be had in any public grounds than is afforded from the hills in Golden Gate Park. Skirting its western boundary, the ocean in all its majesty can be seen, and all around are mountains, valleys, and charming bits of landscape. In the park itself there are many objects of interest, and a description of some of the more prominent may not be out of place.

Strawberry Hill at once commands attention. Driving from the ocean beach along the South Drive a splendid view of the pines on the western slope, with their tops clearly outlined against the sky, is obtained; which, when the pines are matured, will be something exquisite. Turning off the South Drive on to the road leading to the lake embankment the eye is charmed with the bank of flowers from South Africa, in their rich and brilliant colors of purple, pink, white, and yellow. Then Stow Lake, in all its loveliness, bursts upon the view. The genius of the landscape gardener is here seen to its fullest extent. The lake is dotted with islands, and trees and shrubs in endless variety all along its slopes, while boats are to be seen gliding over its rippling surface. The rustic boat house, the stone bridge and Roman bridge, past the poppies on the banks of the lake, you reach the foot of the falls named after Mr. C. P. Huntington, by whom they were presented to your Commissioners. They were constructed at a cost of $25,000. In the pool at the bottom of the falls trout can be seen swimming about and jumping out of the water after flies. Looking up, a scene of enchantment greets the eye. Ferns are seen peeping out of the rocks, and up the sides of the falls the branches of trees are seen forming a natural arch across the rushing waters underneath. One can sit for hours watching the waters leaping down into the quiet pool and then flowing under and over the stepping-stone work across till they find a lodgment in the lake. The east side of the hill to the north and south of the falls, which is sheltered from the cold winds from the ocean, presents an appearance that is simply entrancing. The trees, flowers, and shrubs are in a flourishing condition and the ferns among the rocks are exquisite in their color and tracery. There are pretty pieces of coloring all up this side of the hill. A remarkable change has taken place in two years, when the hillside was first planted. Leaving this scene reluctantly you drive to the top of the hill, deriving new delights, at every turn of the road, from the gorgeous scenery of land and ocean spread out before you, and reach the observatory erected through the generosity of Thos. U. Sweeney, a gift that will always stand as a monument to his philanthropy and love for his fellow men. It is more often termed a panorama, for nowhere else can a better view of the ocean and surrounding country be obtained. From the reservoir the waters of the falls come rushing out and zigzag down the slope until they reach the carriage way, where they make a fall of fifteen feet and pass under the roadbed and under the quaint rustic foot-bridge, where they make their plunge over the falls, and then down the rapids till they make their final leap into the pool. Any one possessed of a poetic imagination will find plenty of scope while standing on this rustic bridge. Below is the lake glistening in the sun, and farther on the park with its many objects of interest. Behind you can hear the soft murmur of the waters of the creek as they wind gently around the rocks and creepers, and before you can see the waters and hear their loud roar as they dash over the falls. A more striking contrast could not be imagined, or rather a more fitting illustration of peace and strife. It is not to be wondered at that Strawberry Hill is the favorite resort for all.

The building and playground for the children form one of the most useful and interesting attractions in the park. They are within easy distance of the cable and electric cars. The building, the cost of which was defrayed out of a donation of $50,000 from the late Senator Sharon, is a gray stone with slate roof. It is of two stories, the lower being utilized as a play-room for the children during stormy weather, and the upper as a restaurant, where refreshments can be procured at very reasonable rates. There are all sorts of appliances for the amusement and recreation of the little folks. Merry-go-rounds, swings, springboards, donkeys for riding, and goats for driving are there, and on fine days they are crowded with delighted children, whose mothers and grown-up sisters sit on the seats and derive as much pleasure from watching their enjoyment. The grounds are well sheltered from the cold winds, and all together it is a most charming spot. Adjoining the childrens' quarters are the baseball grounds, where the youthful votaries of the national game have ample space for practice.

The conservatory is a never-failing attraction. It is built of wood and glass, and is two hundred and fifty feet in length, and an average breadth of seventy-five feet. The vestibule, in the middle, facing the south, is supplied with fountains and seats for visitors, and from it the grand central dome is entered. Throughout the conservatory vegetable life can be seen from almost every tropical clime, and flowers of every shade that bloom under softer skies than ours. The original building was destroyed by fire in 1882, and the present one was erected the following year through the generosity of the late Charles Crocker. It is one of the most attractive structures in the park.

The squirrel cage and aviary are close to each other, and combined form one of the most interesting features of the park. In the former there are squirrels of all sizes and colors, and in the latter there are feathered beauties from almost every land. The sweet songs of the birds have an indefinable charm for old and young, who for hours at a time watch the songsters flitting from tree to tree. Along the path leading to the cage and aviary ferns from the Hawaiian Islands have been planted and are doing splendidly.

The deer glen and buffalo park are not far from each other, and after visiting one the other naturally receives attention.

The elk, the gift of Mr. Alvinza Hayward, have long since become accustomed to their surroundings and are exceedingly tame. The buffalo, the remnants of the monarch of the plains, are thriving well and, like the deer, are producing their kind. The big grizzly bear, the gift of the "San Francisco Examiner," is kept out of harm's way by a strong cage, also the gift of the "Examiner." At first he objected to his strange surroundings and tried to make his escape, but now he seems reconciled to his fate, and is a very popular attraction.

The rockery on the side of the hill facing the conservatory is a charming spot. The tree ferns from Australia and New Zealand, in company with more humble natives, present a grand sight, which is intensified by beautiful bits of flowers peeping out from among the rocks and ferns.

The music stand, with the unique stand for the musicians, is protected on the south and west by terraced ridges. The seats do not accommodate one third of the people who attend the band concerts on Saturdays and Sundays, and the present grounds will soon be devoted to other purposes.

Alvord Lakelet, where the swans, ducks, and other aquatic birds disport themselves, is the first object to attract the attention after entering the park by the Haight Street entrance. Close to it is the bridge of concrete, with its archway hung with artificial stalactites.

The peacock meadow is close to the main entrance of the park. It consists of about two acres of lawn and is surrounded by a wire screen fence three feet in height. It is interspersed with trees and foliage, affording necessary shelter to the fowls.

On the Great Highway, facing the ocean, is the Beach House, where every accommodation is afforded visitors to that portion of the park, and where picnickers can eat their lunch without the discomfort of having it mixed with sand.

The park is not without its statues. There is the statue of General Henry W. Halleck, the gift of General H. W. Cullom, his chief of staff. Then there is the statue of President Garfield, erected by the Garfield Committee, and the statue of Rev. Dr. Starr King, erected by his admirers. The German residents in the city propose to erect a Schiller and Goethe monument. Permission will be granted them, provided the work is of high art and the material either of bronze or marble. It is also proposed to place a bust of President Grant in the oak grove, the bust to be in the center. The Key monument, in the rear of the auditorium of the music stand, the gift of the late James Lick, with the words of the "Star Spangled Banner" inscribed on the slabs, is one of the chief objects of interest in the park. The "prayer-book cross," on the top of a hill, was the gift of the late George W. Childs, of Philadelphia. It was erected to commemorate the first reading of the Episcopal service on the Pacific Coast by the chaplain of Sir Francis Drake.

The Memorial Museum, on the site of the Midwinter Fair, is fully referred to elsewhere. There are other objects of interest, including the forest, the speed track, the bicycle road, etc., which need not be enlarged upon.

PRESENT NEEDS.

It has long been universally admitted that ample and convenient open places for public resort and recreation are essential, not only to the pleasure and comfort, but to the physical health and mental and moral growth of the people. And it is a well-known fact that public parks and gardens have developed, both in their creation and growth, and in their use and application, new and almost incredible tastes, capacities, and powers in the people themselves. It is also well understood that popular restlessness is exhaled and dangerous passions drained off in the roominess which these resorts afford.

In recent years there has arisen a feverish anxiety in the large cities in the East for the acquisition of parks and boulevards, more particularly in New York and Chicago. Sites for new parks have been purchased at enormous cost, and still the cry is for more. This proves how keenly the people in these densely populated cities appreciate and are ready to support these "lungs of a city," and how desirous they are of providing the best opportunities for the enjoyment of their own leisure, artistic tastes, and rural instincts. For example, for Central Park alone, New York appropriated $1,250,000 last year. A desire was expressed to have a botanical garden in one of the parks, to embrace about two hundred and fifty acres. It was estimated that it would cost $1,000,000 to improve the two hundred and fifty acres, or an average of $4,000 per acre. Very little time was lost in raising the necessary funds. The State Legislature voted $250,000, an equal amount was obtained by private subscriptions, and the remaining $500,000 by the issue of bonds. At the same ratio of cost for improvement, it would take $4,160,000 to improve Golden Gate Park, with its one thousand and forty acres. Chicago last year appropriated $1,500,000 for park purposes, and Boston $746,000. In New Jersey, by the vote of the people at a special election, $1,000,000 was appropriated for the same purpose, and in Baltimore $1,000,000 was appropriated for a new park and $300,000 for maintaining finished parks.

San Francisco has practically only one park, and though it is not claimed that it is the most artistic and attractive pleasure ground on this continent, it is claimed that looking to the character of the soil, and the difficulties and discouragements that were encountered and had to be overcome, as much, if not more, in the shape of improvement and development can be shown for the money appropriated than in any other artificial resort. This is no vain boast, but facts and figures make it susceptible of proof. The people take a just pride in their elegant pleasure ground, and that they should be willing to thus tax themselves for the benefit of future generations is an evidence of their appreciation of the work done by the Commissioners, and their faith that the powers conferred upon them have been and are wisely and economically used for the best interests of the community. Much has been done in the past, but much remains to be done, and it is absolutely necessary that liberal appropriations should be made for the present and future needs of the park.

THE FOREST.

The forest of the future, comprising five hundred acres, which was planted within the past ten years, to the west of Twenty-fourth Avenue, is developing slowly but surely. To bring the trees into a healthy, thriving condition, they must be liberally supplied with fertilizers. Loam is as essential to their life as food is to an animal. As the life and growth of animals depend upon the circulation of the blood, so does the life and growth of trees depend upon the circulation of sap. Persistently starve an animal, and it soon sickens and dies. Starve a tree, and it becomes stunted from a lack of nourishment and a prey to vermin. The result is it gets what is termed "bark bound," and it takes years to loosen the bark again and bring the tree back into full vigor. Persistently starve it, and it will die. The trees in the forest must be fed; that is essential in the highest degree. The supply of loam must, therefore, be continued and applied at once, otherwise the trees will suffer. Money expended on the forest of the future will be repaid amply in the vigorous growth of the trees and the permanent adornment of that portion of the park.

Fairmount Park, Philadelphia; Forest Hill Park, St. Louis; Prospect Park, Brooklyn, and Druid Hill Park, Baltimore, are all ornamented with splendid timber, which forms an attraction for tourists from other countries. These were, however, natural forests of timber that had been planted around the residences of wealthy men, who had sold out to the cities to make room for the parks. There the trees had a natural foundation of over two feet of loam, upon which the roots fed, giving life and vigorous growth. Here in our forest there was only barren sand for a foundation. Hence, the necessity of liberally supplying that which is essential for the life and growth of the trees. A cartload of good soil placed around a tree is a permanent improvement and insures a permanent tree, because the moisture will be retained and the fertilizers will give daily nutriment. There can be no difference of opinion as to the utility of the forests. Besides being one of the most delightful and attractive forms of pleasure ground, they are of undoubted value in preventing the dissemination of malaria. The ancient Romans recognized the value of forest masses as a barrier against the diffusion of fever germs, and to secure them against destruction invoked the protection of their divinities. The turpentine exhaled from pine forests possesses, in a larger degree than any other substance, as far as is known, the power of converting the oxygen of the atmosphere into ozone. This agent, owing to its remarkable affinity for the products of decomposition, purifies the air by the destruction of deleterious gases and the oxidation of decomposing organic matter. Hence, the high estimation in which the pine-growing regions are justly held as sanitary resorts, where the purity of the air renovates the system debilitated by the foul atmosphere and unsanitary conditions of our crowded centers of population. Viewed from this aspect alone, our forests will have a value far greater than can be estimated in money.

THE NEW MUSIC GROUNDS.

The present music grounds having become utterly inadequate for the accommodation of the crowds that attend the band concerts, it has been decided to convert the Midwinter Fair building sites and surrounding grounds into new music grounds. This will be a work of considerable magnitude, owing to the leveling of the hills surrounding the valley and shutting off the winds. Between sixty and seventy acres will have to be graded, shaped, and loamed. Walks will have to be laid out, water-pipe laid, trees planted, besides other necessary work. A band stand will also have to be erected in keeping with the progressive nature of things, and, for the convenience of the public, a bridge under the main drive to the valley will have to be built. Music has an irresistible charm for all sorts and conditions of men and women, and too much money cannot be expended in making their surroundings attractive and comfortable while listening to it. When the contemplated improvements are completed, Concert Valley with the museum and its many interesting exhibits, and Recreation Valley adjoining, will be the center of attraction for visitors, as altogether it will be as pretty a piece of landscape gardening as can be seen anywhere.

THE GREAT HIGHWAY.

The completion of the boulevard on the Great Highway running from the foot of the Cliff House Hill facing the ocean, to the county line, cannot be too strongly urged, and should not be longer delayed. One mile was constructed last year, and the remaining mile should be constructed this year. When that is accomplished it will inaugurate a magnificent drive for carriages. One can then drive through the park and along the Great Highway to Lake Merced, where the county road is met, and when that road is finished the return drive can be made to the city by the Ingleside and up toward the Mission or back by Corbett Road or Seventh Avenue again to the park. All that is lacking to complete that system is this mile of the boulevard. There are great possibilities in the future for this highway. Within the past six years two hundred feet of ground has been reclaimed from the ocean. When the shelter fence was constructed in 1890 the water rose to within a few feet of it. Now there is a clear space of sixty feet from the fence, and if the reclamation continues in the same ratio there will soon be sufficient space for another drive, if that should be deemed necessary. Supposing this should be carried into effect in the near future, there could be an open drive fronting the broad Pacific, and the other protected by a belt of trees dividing the two drives. That is, however, a matter for the future, and not for the immediate present. Spasmodic attempts have been made by the daily press to get a boulevard system adopted in the city to connect with the drives in the park, but at no time has any definite action been taken to carry out the project. Chicago has nearly three hundred acres of boulevards, from one hundred to two hundred and fifty feet wide, connecting her parks, and all lined with trees. New York, Boston, Detroit, Buffalo, Rochester, and other Eastern cities have all had boulevard systems in operation for years, and the benefit derived therefrom is incalculable. Looking again at the possibilities of the future, it would not be a very difficult or very costly undertaking to continue the Great Highway all the way to the Presidio, skirting the water; thereby connecting the park with the Presidio. No more delightful or picturesque drive could be imagined, and with Twenty-fourth Avenue and Fourteenth Avenue as connecting roads, there would be opened up a grand boulevard system that would attract men of wealth to the city, and add in no small degree to the value of property. Neither of these avenues are improved; at present they are nothing but sand hills. They ought to be at least one hundred and fifty feet wide, and if the city is to have a system of boulevards no time should be lost in placing these two avenues in proper shape, because in a few years they will be built over and then the golden chance will be lost. These suggestions are offered by your Commissioners, in the hope that they will arouse in the public mind sufficient interest to their importance from more than one standpoint.

BICYCLE ROAD EXTENSION.

Your Commissioners have always borne in mind the fact that the public is made up of separate human beings with separate tastes, whose comfort and convenience demand regard. Keeping this in view, the bicycle road was constructed last year exclusively for the use of patrons of the wheel, and a further extension of this road is proposed during the coming year, to run parallel with the Main Drive.

The rapid development of the present interest in bicycling among all classes is something astonishing, and as the park is a favorite haunt of cyclists it is incumbent upon your Commissioners to attend to their interests and wants. Cyclists of both sexes in large numbers frequent the park every day and night when the weather is favorable, and during the afternoons the large open space adjoining the music grounds is filled with ladies learning to ride the wheel, most of them attired in knickerbockers or bloomers. Any day in the week a long line of bicyclists can be seen on the road specially constructed for their use, and on Sundays every drive in the park has its large quota. The extension of the road can also be urged with a view to the protection of the bicyclists from runaways and from collisions with carriages.

BRIDLE ROAD.

Visitors to the park in carriages, pedestrians, and bicyclists have had their share of attention in the matter of comfort and convenience, but equestrians have been entirely overlooked. They complain, with justice, that they are all large taxpayers, and loudly demand recognition at the hands of your Commissioners. True, the drives are open to them, but they insist that they should have a road where they would not be subjected to the inconvenience of having to dodge carriages, bicyclists, and pedestrians. To remedy this grievance, and recognizing the justice of the claim put forward by equestrians, your Commissioners propose to construct a bridle road exclusively for their use. It will commence at Strawberry Hill and run through the forest to the ocean beach.

OFFICE BUILDING.

The present park lodge has outlived its time, and it is absolutely necessary that a new building, in keeping with the changed condition of the park and the times, should be erected. There is no vault for the safe-keeping of papers and maps worth thousands of dollars. There is no office for the Superintendent and Secretary, but all are cramped up in one small room.

The new lodge will be built on the opposite side of the drive from the present building. The principal room will be utilized as a board room; then there will be a map room, draughting room with draughting tables, Secretary's room, an office for the Superintendent, and seven living rooms for the Superintendent and his family.

NEW WALKS.

Regard for the convenience and comfort of those who cannot afford to visit the park in carriages has led to an unusual extension and variety in the character of the walks, and yet more walks are urgently needed. Walks are required to connect Stow Lake with the aviary. The grounds and walks were so cut up by the Midwinter Fair people that branch walks leading to the Memorial Museum and Recreation Grounds must be made.

WATER-PIPE.

The extension of water-pipe throughout the park must be carried on. It is principally needed in the vicinity of the grounds occupied by the Midwinter Fair buildings, in the west end of the park, and on Twenty-fourth Avenue and D Street it is also very much needed.

MAINTENANCE.

The maintenance of the grounds, drives, police, and museum will require $135,000—a small sum compared to the amounts appropriated for the maintenance of parks in the East.

ELECTRIC LIGHTS.

As the park is never closed to the public, the absence of proper and sufficient lights has been a great drawback. It was impossible for your Commissioners to bear the cost out of the appropriation, and nothing was done. Now a movement has been started among the citizens themselves guaranteeing to defray the cost. Nothing definite has been done, but there is no doubt the idea will be given attention without unnecessary delay.

Your Commissioners are favorably impressed with the scheme to light the park from the avenue to the ocean beach, as it will attract thousands of pedestrians, bicyclists, and visitors in carriages, to take advantage of the opportunity of getting away from the din and glare of the streets of the city. If it should be carried through successfully, your Commissioners will insist that the first two miles be laid underground, and that the poles for the balance shall be ornamental as well as useful.

OTHER NEEDS.

There are many other improvements for beautifying the park, if the necessary funds were appropriated. Among them is the improvement of the old quarry at the bell tower, which could be made one of the prettiest and most attractive spots in the park. Superintendent McLaren, with the eye of a true artist, would convert the bottom of the quarry into a lily pond. He would plant ferns on the rocks on the shady side, and succulents and sun-plants on the rocks facing the south. Then he would have little rills of water and drips to keep the ferns green. There are other bits of coloring in his mind's eye for the enhancement of the beauties of the old quarry, when the proper time comes. There is a pond, also, which was built last year at the same time as the continuation of the South Drive, which, when improved and made beautiful with aquatic plants, will be a charming spot. Another pond, built by the unemployed during the winter of 1894, could be made a most beautiful place.

REPORT OF THE SECRETARY.

Park Office, June 30, 1895.

To the honorable the Board of Park Commissioners:

Gentlemen: I have the honor to submit herewith my report for the fiscal year ending with this date.

V. V. BLOCH,
Secretary.

RECEIPTS AND DISBURSEMENTS FROM JULY 1, 1894, TO JULY 1, 1895.

RECEIPTS.

From taxes	$222,538 65
From children's quarters	3,061 31
From donations	2,166 00
From fines	545 00
From sale of old pump	275 00
From scenic railroad	168 03
From rents of fruit stands	120 00
From rent of P. and O. R. R. depot	100 00
Balance from last year	77 15
	$229,051 14

DISBURSEMENTS.

Construction account	$114,259 65
Maintenance account	108,683 59
Salaries—Superintendent and Secretary	5,700 00
Balance	407 90
	$229,051 14

CONSTRUCTION ACCOUNT.

Structures.—	
Final payment on boat house	$2,792 94
One redwood log cabin	500 00
Japanese tea houses, etc.	4,500 00
Canadian cottage	250 00
Grading, Fine Arts Building, and grounds	368 50
Ladies' cottage—labor, cement, lumber	193 33
Architects' fee for boat house, new lodge, and ladies' cottage	1,550 65
Constructing fence from Stanyan Street to Twenty-fifth Avenue, on the north	2,671 35
Constructing bridge, Strawberry Hill	169 20
Lumber and cases for museum, bicycle rack in boat house, foundation for cider press, construction of deer shelter, lumber, hardware, bark, fencing wire, lime, etc.—labor and material	1,263 79
	$14,259 76
Waterworks.—	
New waterworks system, extension of distribution pipe system, including pipe, labor, etc.	$16,236 38
Drainage.—	
Grounds, pipe, lumber, labor, etc.	$334 83

Ways.—

Constructing drive south of lake	$4,445 40
Constructing boulevard—labor	1,308 50
Macadamizing and grading boulevard	5,067 00
Constructing bicycle track	4,501 30
Widening main drive	2,653 79
Bituminous walk, Aviary	356 79
Grading drive, Twenty-fourth Avenue and D Street, and macadamizing same	950 00
Constructing walk to bear pit; constructing path to Museum; powder, fuse, hardware, surveying, cement, etc.	775 50
	$20,058 28

Grounds.—To labor, etc., of grading, forming, dressing, trimming, and fertilizing grounds newly brought to a finished condition in this respect, and purchase of loam and plants—

Loam, clay, and manure	$10,544 77
Recreation grounds	6,672 25
Grading recreation grounds	1,248 00
Grounds around waterworks	4,465 75
Constructing grounds, Fair grounds	600 00
Plants and bulbs	695 54
Japanese gardens—labor	318 00
Use of horse-scraper, enameled signs, and improving grounds	1,135 85
	$25,680 16

Plantations and Forests and Reclamations.—Planting trees, loam, etc., for reclaiming the sand drifts, labor, and material—

Loam	$18,805 35
Planting trees—labor	6,837 85
Trees and tree seeds	1,621 40
Gypsum, lumber for stakes, etc.	41 75
	$27,306 35

Conservatory.—

Purchase of new plants especially for the Conservatory	$275 60

Small Works.—

Rockwork on island—labor and material	$2,749 95
Hauling manure—labor	381 25
Bear pit—labor and material	1,409 58
Rocks to waterfall, paving lake, stone bridge, labor, and use of derrick	489 00
	$5,029 78

Arboretum.—

Labor	$806 45

MAINTENANCE ACCOUNT.

Structures.—Labor, lumber, paints and oils, hardware, glass, etc., devoted to and used in repairs and general maintenance of buildings, moving and repairing same—

Labor	$3,359 60
Material	3,625 77
	$6,985 37

Waterworks.—Labor in repairing, water-pipe, maintenance of waterworks, engineer, coal, labor, and material—

Labor	$4,276 10
Coal	3,794 24
Supplies (valvoline, packing, oils, hardware, etc.)	1,800 86
	$9,871 20

Drainage.—

Labor and material for maintenance of sewers	$515 00

Roads and Walks.—Labor and material, repairing, cleaning, dressing, sprinkling, etc., roads, walks, and concourses—

Maintenance of roads and walks	$7,824 25
Sprinkling and repairing Point Lobos road	1,541 77
Water for Point Lobos road	291 60
Repairing Buena Vista Park road	1,729 25
Powder, fuse, hardware, etc.	90 10
	$11,476 97

Grounds.—

Maintenance of garden and flower plats, lawns, and grounds generally	$36,195 13

Forests and Plantations.—

Labor, trimming out and cutting trees	$688 95

Conservatory.—The current cost of the Conservatory, including labor, material, fuel, etc.—

Labor	$3,998 00
Coal	2,030 11
Pots, plants, insecticides, moss, teak, seed	713 55
	$6,741 66

Policing.—The services of the regular police and extra men—

Labor	$17,276 40
Material and supplies	1,609 89
	$18,886 29

Children's Quarters.—Labor and material—

Labor	$2,501 85
Tickets	150 00
Swings	90 00
Stationery	13 00
	$2,754 85

Museum.—

Labor	$2,171 35
Supplies	421 33
Purchase of Mr. Gruber's collection of stuffed animals and birds	2,000 00
	$4,592 68

Aviary, Deer, Elk, Buffalo, etc.—

Labor	$1,460 00
Material and supplies	2,349 39
	$3,809 39

APPORTIONED ACCOUNT.

Nursery.—The entire nursery expenses, including labor, material, and new stock—

Labor	$4,375 90
Material	517 60
	$4,893 50

Stables.—Including hay and grain, horse-shoeing, attendance, veterinary services rendered, etc.—

Labor	$3,069 50
Hay and grain	7,870 67
Shoeing horses	1,070 00
Harness, drugs, supplies, clipping horses	1,205 57
Veterinary services rendered	160 50
	$13,376 24

MISCELLANEOUS ACCOUNT.

Stock.—

Horses, birds, one mountain sheep, one moose, swan, rolling stock	$4,272 06

Miscellaneous.—

A number of current expenses, not chargeable under either of the foregoing heads, printing demands, office expenditures, telephone, advertising ordinances, stationery, music, insurance on buildings, freight and general expense, attorney's fees, medical services rendered	$6,166 10

DONATIONS TO THE PARK DURING THE YEAR 1894–95.

A. Fisher, representative of Phillipp Fisher, Karlsbad	One mosaic table.
O. Moser, Commissioner-General for Austria	One vase.
C. A. Luckhardt	Two pelicans.
J. H. Woodrum	One squirrel.
Wm. Gall	Two Adiantum pedatum.
Mrs. Woods	Two cacti.
Captain Pitts	One phalanthus, one sanseveria, one acacia, one palm, one bougainvillea, two fruit trees.

Chas. M. Leopold	Collection of seeds.
Mrs. Rowley	One canary.
A. D. Grimwood	Collection of seeds from South Africa.
J. L. Davis	Two vases.
H. Breece	One English thrush.
Wm. M. Lent	One bronze statue.
Mrs. Kimball	One package box elder seeds.
J. R. Shotwell	One Cardinal bird.
H. Miller	Ostriches.
A. Clement	Gray squirrels and one Australian magpie.
Geo. Cuthbert	One package of seed and palm seeds from Jamaica.
C. E. Morse	One pound sweet pea seeds.
S. W. Kellett	Seven mountain quail.
Chas. E. Paxton	Turkeys.
J. B. Stetson	One box nutmeg tree seed.
Eddie Dietz	One squirrel.
L. Van Fossen	One deer.
Mrs. Hesthal	One red squirrel.
John W. Bourdette	Two Java sparrows.
Mrs. Paysen	One German magpie.
F. S. Judah	One owl.
D. H. Murray	One Ching-Chili cat.
Dr. A. Hiller	One parrot.
A. Neustadt	Seeds of the rosella plant.
Mrs. Luscombe	One fawn.
Miss Giles	Linnets.
Mr. Pattison	Collection of orchids.
Mrs. Hager	Collection of birds.
Sunset Seed and Plant Co.	Chrysanthemum plants.
Miss Polastri	One Cardinal bird.
S. P. Stow	Olive trees.
Mrs. Tinoco	One Mexican pheasant.
"San Francisco Examiner"	One grizzly bear.

LIST OF DONATIONS TO THE PARK MUSEUM.

Aver, James H., of San Francisco, Cal.	Five specimens of intricate hand whittling; one ancient book.
Andrews, Col. A., of San Francisco, Cal.	One Confederate bond, $1,000; one Confederate note, $100; one Confederate note, $50.
Adams, C. W., of Nelson, Cal.	Fifteen Indian stone implements.
Anderson, Captain, of San Francisco, Cal.	One skin of bald-headed eagle from Alaska.
Barton, Stephen, of Kernville, Cal.	One specimen of gold and silver ore.
Braun, F. W., of New York City	Sixty specimens of minerals and fossils.
Belland, L. O., of Astoria, Or.	One pair of Alaskan Indian snowshoes.
Bloch, Miss V. V., of San Francisco, Cal.	Relic from the catafalque obsequies of President Garfield.
Braverman, M., of Visalia, Cal.	Nine specimens of minerals, rocks, and ores.
Barker, S. A., of San José, Cal.	One ancient Indian stone implement.
Boomer, Mrs. A. H., of San Francisco, Cal.	One peacock, stuffed and mounted.
Breon, Mrs. Paul, of San Francisco, Cal.	One ancient bible; one beaded Indian necklace; two photographs of Walipai Indians.
Bardell, John L., of San Francisco, Cal.	Fifty-two articles, consisting of historical relics, colonial relics, petrifactions, and curiosities.
Barlow, C., of Santa Clara, Cal.	One mounted kingfisher; twenty-six bird's eggs; nine ornithological photographs.
Bemis, W. E., of Livermore, Cal.	One tooth of mountain lion.
Bevill, Dr. Cheeres, of Winfield, Ark.	Forty-nine Indian stone relics.
Brown, F. E., of Groton, N. H.	Five specimens of minerals.
Converse, A. W., of Windsor Locks, Conn.	Seventy specimens of Indian stone implements.
Cotton, C. N., of Gallup, New Mexico	One ancient stone ax; one Navajo Indian basket; one Navajo Indian blanket; one Navajo Indian loom; one Navajo Indian squaw belt; one pair Navajo Indian moccasins; one Navajo Indian bow, with six arrows; one package of peridots; one package of natural garnets.
Currier, C. W., of San Francisco, Cal.	One specimen of ruffle-head duck, mounted.
Cahn, Lazard, of New York City	One very fine specimen of crystallized zircon.
Carnaghan, C. S., of Groton, N. H.	One specimen of green beryl; one specimen of muscovite.
Carnaghan, Mrs. J. L., of New York City	One specimen of pink quartz.
Chapman, Messrs S. H. & H., of Philadelphia, Pa.	Three historical medals; three pieces of colonial and continental currency.

Carter, Cullen L., of Long Island, N. Y. .... Three specimens of minerals.

California State Mining Bureau, of San Francisco .... Three oil paintings; one model of a canoe made by the natives of the South Sea Islands; two plaster casts of rare type; Indian stone implements; seventeen pieces of bone, representing vertebra, ribs, and jawbone of a whale; two pairs of horns of the elk; two pairs of horns of the reindeer; two pairs of horns of the mountain sheep; one pair of horns of the moose; one pair of horns of the deer; one hundred and seventeen specimens of minerals, rocks, and ores.

Elhard, Oscar, of Guadalajara, Mexico .... Ninety specimens of ancient idols, probably Aztec and Toltec.

Fife, Claude, of San Francisco, Cal. .... Fifty specimens of bird's eggs.

Fieltz, Mrs. Mary, of San Francisco, Cal. .... One ancient pattern sampler.

Fuller, A. N., of Lawerence, Kansas. .... One fine specimen of rhodochrosite.

Grant, Irwin, of Visalia, Cal. .... Two specimens of tarantula, mounted.

Gall, William F., of San Francisco, Cal. .... One ancient horse-pistol.

Gerberding, Mrs. M. J., of San Francisco, Cal. .... One specimen of white branching coral.

Hilton, Oscar, of San Francisco, Cal. .... One antique Swiss sword.

Harris, A., of San Francisco, Cal. .... Two specimens of China pheasants, mounted.

Henderson, F. G., of Tecumseh, Ala. .... Five specimens of rocks and ores; six Indian arrowpoints.

Hing, Jay, of San Francisco, Cal. .... One ancient Chinese coin.

Humkins, O. L., of South Groton, N. H. .... Six specimens of minerals.

Hoffman, W. E., of Ukiah, Cal. .... One rattle of rattlesnake.

Heifer, J. A., of San Francisco, Cal. .... One hundred and forty-three coins (silver, copper, and nickel, United States and foreign); three gold coins of the United States; five pieces of United States fractional currency.

Hubbard, Mrs. F. V., of San Francisco, Cal. .... Fifty-five articles, consisting of ancient chinaware, vases, antique book, antique jewelry, Egyptian relics, minerals, Indian relics, and miscellaneous curiosities; twenty-five souvenir medals.

Jewett, S., of Marysville, Cal. .... Four boxes of minerals, rocks, and ores.

Knight, H. A., of San Francisco, Cal. .... One specimen of free gold quartz.

Lawson, Y. C., of San Francisco, Cal. .... One Esquimau costume; one pair Esquimau boots; one fossil tooth of mastodon.

Lord, Eugene A., of San Francisco, Cal. .... One Portugal copper coin; one laurel wood breastpin; war relic.

Leonhardt, Miss Marie, of San Francisco, Cal. .... One Central American silver coin; one Spanish silver coin.

Langdon, Miss Stella, of San Francisco, Cal. .... One silver coin of Brazil.

Lee, Hoo, of San Francisco, Cal. .... One Chinese bracelet.

Mow, Chu Chong, of San Francisco, Cal. .... One Chinese silver coin.

Montgomery, S. H., of Portsmouth, Ohio .... Five specimens of mound-builders' relics.

Merrill & Stone, Messrs., of Paris, Me. .... Fifteen specimens of Maine minerals.

Orcutt, C. R., of Orcutt P. O., San Diego County, Cal. .... Fourteen specimens of land and marine shells; three species of fossils; six specimens of minerals; thirteen species of native seeds; one specimen of vegetable incrustation.

Prill, Dr. A. G., of Sodaville, Or. .... Twenty-three bird's skins; one hundred and thirty-three bird's eggs in original sets, with data.

Parker, Mrs. Judson, of Sharon, Vt. .... One ancient loom reed.

Perry, Mrs. E. O., of South Paris, Me. .... Five specimens of minerals.

Pattison, John, of San Francisco, Cal. .... One skin of Baird's cormorant.

Pendleton, Alvah, of Oakland, Cal. .... One colonial newspaper.

Rowe, Mrs. R., of San Francisco, Cal. .... One skin of Rufous humming-bird.

Roebling, W. A., of Trenton, N. J. .... Thirty-nine specimens of minerals.

Reynolds, Frank C., of San Francisco, Cal. .... One serpent (double-headed), in alcohol.

Rochat, Arthur, of San Francisco, Cal. .... One piece of French hand embroidery.

Sheldon, H. L., of Middlebury, Vt. .... One ancient flax spinning-wheel.

Spaulding, Mrs. E. S., of Rumney, N. H. .... Two specimens of minerals.

Staples, D. J., of San Francisco, Cal. .... One old ruler; one old sand box; historical relics.

Seung, Chew, San Francisco, Cal. .... One specimen of Chinese tea, natural condition.

Sing, Jung, of San Francisco, Cal. .... One specimen of native Chinese writing ink.

Stroud, J. R., of San Francisco, Cal. .... One wooden tray, carved by natives of South Sea Islands.

Shields, A. M., of Los Angeles, Cal. .... Twenty-six bird's eggs in the original sets.

United States National Museum, of Washington, D. C. .... One hundred and five casts of rare prehistoric stone implements; one hundred and twenty-nine marine invertebrates; ninety-one specimens of rocks, ores, and minerals.

Walz, W. G., of Los Angeles, Cal. .... One ancient mound ax, from Arizona.

Whittier, Charles, of Gilford, N. H. .... One ancient loom reed; one ancient cooper's plane; one ancient almanac; one ancient pair of spectacles.

Wells, G. E., of Manhattan, Kansas .... Nineteen mineral specimens and fossils; nine Indian stone relics.

Wilcomb, O. V., of Wiers, N. H. .... Ten specimens of Indian stone relics.

Webb, W. F., of Albion, N. Y. .... Ten bird's eggs.

Wallace, M. J., of Tracy, Cal. .... Thirteen specimens of petrified wood and fossils.

PLANTS GIVEN TO PUBLIC INSTITUTIONS.

TO PUBLIC SCHOOLS.

Achyranthus	20	Heliotrope	2
Ageratum	6	Helianthus	12
Ampelopsis	3	Hydrangea	3
Acacia	100	Habrothamnus	3
Birch	1	Juniper	1
Bambusa	1	Lobelia	250
Broom	2	Mandevilla	1
Cineraria	30	Mesembryanthemum cordifolium	120
Cistus	6	Olive trees	1
Clianthus	6	Plumbago	1
Cupressus macrocarpa	120	Passiflora	2
Cosmos	50	Polygala	1
Cedar Atlantica	1	Pelargoniums	9
Carnation	2	Pansies	12
Clematis	2	Picea pinsapo	1
Dianthus barbatus	20	Petunia	6
Diosma	8	Stevia	1
Diploppapus	2	Tacsonia	15
Dahlias	10	Tecoma	4
Erica	6	Tagetes	6
Elm	1		
Geraniums, in variety	15	Total	875
Gladiolus	12		

TO GIRLS' DIRECTORY.

Acacia	50	Genista, in variety	50
Buddleya globosa	2	Leptospermum	12
Cupressus macrocarpa	12	Myoporum	1
Clianthus puniceus	2	Melaleuca	2
Ceonothus Africana	4	Pinus, in variety	12
Dracæna Australis	4	Pepper tree	1
Datura arborea	2	Pittosporum	2
Erica	2		
Eucalyptus	12	Total	170

TO ANGEL ISLAND.

Acacia	6	Erica; Mediterranean	2
Abutilon alba	2	Lobelia	6
Achania	2	Lantana	2
Antirrhinum	2	Œnothera Lamarkiana	6
Cistus	6	Scabiosus	12
Clianthus	2	Vines, in variety	18
Diosma	4	Wallflower	12
Eucalyptus	2		
Erica; Cape species	2	Total	86

TO GOLDEN GATE LIFE-SAVING STATION.

Abutilon	2	Pritchardia	2
Acacia	36	Pinus, in variety	50
Broom; white and yellow	28	Thuja gigantea	10
Dracæna Australis	12	Tacsonia	6
Erica	2		
Leptospermum	22	Total	170

TO ST. MARY'S HOSPITAL.

Collection of flowering seeds.

TO ST. JOSEPH'S HOME.

Phormium tenax	2

TO OLD LADIES' HOME.

Anemone; European	12	Geraniums	25
Abutilon	4	Œnothera	6
Buddleya globosa	1	Passiflora	2
Cistus	2	Polygala	1
Clianthus	2	Roses	6
Dianthus	25	Thyme; golden	50
Diosma	6	Tacsonia	6
Datura	2		
Dolichos	4	Total	154

TO SAN FRANCISCO BOYS' CLUB ASSOCIATION.

Ageratum	100	Lonicera	6
Achania	2	Melaleuca	2
Casuarina	2	Pittosporum, in variety	8
Clianthus	2	Prunus Californica	1
Ceanothus	6	Schinus molle	2
Ceanothus Africana	2	Tacsonia	2
Edwardsia	2	Tagetes	6
Erica	1	Thyme; golden	200
Indigofera Australis	1		
Lobelia	200	Total	547
Lophospermum	2		

TO MECHANICAL ARTS SCHOOL.

Acacia, in variety	12	Genista	12
Buddleya globosa	2	Lonicera	8
Ceanothus	4	Olives	6
Clianthus	2	Pittosporum, in variety	24
Cupressus	14	Tacsonia	6
Dracæna Australis	24	Veronica, in variety	24
Eucalyptus	12		
Euonymus	6	Total	158
Erica	2		

TO FRENCH HOSPITAL.

Acacia, in variety	12	Phœnix Canariensis	2
Abutilon	6	Pittosporum	12
Buxus sempervirens	2	Pinus, in variety	20
Cistus	4	Pritchardia Pacifica	6
Ceanothus Africana	4	Schinus molle	2
Chamærops excelsa	2	Thuja gigantea	6
Deutzia gracilis	2	Thuja nepalensis	4
Eucalyptus	24	Veronica	12
Erica	6		
Genista	12	Total	146
Leptospermum	8		

TREES, SHRUBS, PLANTS, VINES, ETC.

TREES AND SHRUBS PLANTED FROM JULY, 1894, TO JULY, 1895.

Abies amabilis	4
Abies concolor	15
Abies Douglassii	49
Abies Menziesii	12
Abies Nordmanniana	12
Abies pectinata	2
Abies cœrulea	3
Abies excelsa	11
Abies brachyphylla	11
Abies firma	3
Abies morinda	9
Abies alba	15
Abies cephalonica	12
Abies nigra	9
Abies nigra dammetto	2
Abies bracteata	2
Acacia melanoxylon	1,800
Acacia fragrans	1,497
Acacia latifolia	8,111
Acacia lophantha	2,047
Acacia mollissima	562
Acacia verticillata	1,695
Acacia calaministrata	5
Araucaria Bidwellii	2
Araucaria imbricata	5
Araucaria excelsa	1
Acer pseudo-platanoides	3
Acuba Japonica	2
Artemesia glauca	35
Agatos robusta	50
Abutilon alba	70
Abutilon rubra	30
Abutilon; Boule de Neige	20
Achania malvaviscus	30
Agathis Australis	38
Azalia Indica	26
Brugmansia suaveolens	3
Buddleya globosa	24
Benthamia frangifera	85
Boldoa fragrans	4
Betula papyrifera	2
Betula alba	2
Bupleurium fruticosum	3
Cytisus Canariensis	62
Cytisus laburnum	6
Cytisus spinosa	580
Cytisus hirsuta	240
Colquhounia vestata	6
Ceanothus Africana	111
Ceanothus Californica	600
Calystegia lanceolata	160
Cuphea platycentra	100
Cupressus Lawsoniana	431
Cupressus macrocarpa	1,367
Cupressus ericifolia	200
Cupressus Goveniana	42
Cupressus funebris	12
Cupressus pyramidalis	15
Cupressus Guadalupensis	20
Cupressus Braziliense	24
Cupressus torulosa	12
Cupressus lusitanica	14
Camellia Japonica	77
Cryptomeria elegans	3
Cryptomeria Japonica	44
Cephalotaxus fortunei	12
Coprosma Baueriana	63
Cornus Siberica Spathii	5
Cistus ladaniferus	202
Cedrus deodara	14
Cedrus Atlantica	6
Cerasus Japonica pendula	12
Colletia ferox	4
Cistus rosea	130
Cistus salviafolia	60
Cotoneaster buxifolia	116
Clianthus puniceus	290
Calicoma serratifolia	9
Casuarina quadrivalvus	110
Cerasus laurus cerasus	6
Coriaria myrtifolia	100
Cassia floribunda	100
Calistris cupressiformis	6
Diplopappus crysophylla	12
Diosma ericifolia	18
Duranta Plumerii	1
Dryandra	1
Deutzia gracilis	300
Deutzia crenata	12
Dracæna Australis	25
Dracæna Fosterii	1
Eucalyptus, in variety	287
Erica Mediterranea	40
Erica arborea	70
Erica alba	70
Escallonia Philippiana	6
Escallonia rubra	25
Escallonia rosea	65
Escallonia floribunda	2
Euonymus aurea	82
Euonymus radicans	97
Euonymus Japonica	27
Edwardsia microphylla	6
Frenela rhomboides	6
Fraxinus platycarpus	1
Genista tinctoria	2,849
Genista candicans	510
Genista lenifolium	90
Genista alba	800
Genista Eldorado	1
Genista Canariensis	320
Guevina avellana	1
Geitnoplesium cymosum	2
Goodia latifolia	50
Grevillea robusta	2
Grevillea Hertii	7
Hydrangea paniculata	12
Hydrangea hortensia	266
Habrothamnus elegans	68
Habrothamnus coccinea	70
Hypericum Moserianum	492
Hypericum flavum	1
Hymenosperum flavum	1
Hibiscus macrophylla	10
Isochroma tubulosa	12
Ilex Europea	1
Juniperus communis	39
Juniperus Hibernica	6
Juniperus compacta	72
Juniperus prostrata	54
Juniperus pyramidalis	2
Juniperus Japonica var.	6
Juniperus Japonica	6
Juniperus decussata	6
Juniperus drupacea	3
Juniperus pendula	3
Juniperus Chinensis	3
Juniperus Capensis	3

TREES AND SHRUBS PLANTED FROM JULY, 1894, TO JULY, 1895—Continued.

Juglans Sieboldii	1
Jasminum capensis	3
Leptospermum lævigatum	4,846
Leptospermum ericifolia	1,160
Ligustrum Californicum	6
Ligustrum Japonicum	16
Libocedrus decurrens	4
Lycium parvifolium	16
Metrosideros robusta	120
Melaleuca decussata	130
Myoporum maculatum	16
Mahernia odorata	100
Olea sativa	12
Polygala Dalmasiana	125
Phaseolus atro-purpurea	12
Pinus insignis	1,239
Pinus excelsa	3
Pinus Halepensis	840
Pinus rubra	3
Pinus maritima	3,311
Pinus Coulterii	3
Pinus Murrayana	3
Pinus ponderosa	15
Pinus Jeffreyii	12
Pinus macrophylla	1
Pinus Massoniana	12
Pinus Benthamia	12
Pinus Torreyana	6
Pinus strobus	12
Pinus densiflora	6
Pimelia rosea	3
Platanus racemosa	6
Picea nobilis	3
Picea grandis	4
Picea amabilis	4
Picea sub-alpina	2
Populus alba	8
Populus Carolinensis	8
Populus fastigiata	5
Pittosporum eugeneoides	9
Pittosporum nigrum	14
Quercus sempervirens	24
Quercus suberosa	18
Quercus coccinea	12
Retinospora obtusa	16
Retinospora decussata	3
Ribes alpinum aureum	1
Rhamnus Californica	60
Romneya Coulterii	27
Rubus fruticosus	24
Roses	1,000
Salix Kilmarnock	2
Salix caprea, var. pendula	2
Syringa vulgaris	50
Syringa Japonica	12
Syringa ranuncle	5
Syringa; Bertha Darwiniana	5
Syringa; Countess of Paris	5
Syringa gigantea	5
Syringa; Rubra insignis	5
Syringa; Lemoine fl. pl.	4
Syringa; Michael Buchner	5
Syringa; Fleur d'Orange	5
Syringa; Rubella plena	5
Spartium junceum	122
Schotia latifolia	1
Solanum argenteum	2
Schinus molle	36
Sequoia gigantea	36
Sequoia sempervirens	145
Sequoia argentea	6
Taxus aurea elegantissima	12
Taxus baccata	14
Taxus erecta	12
Taxus fastigiata	24
Taxus variegata	6
Thuja gigantea	375
Thuja occidentalis	6
Thuja tartarica	10
Thuja nepalensis	3
Thuja Lobbii var.	6
Thujopsis dolobrata	8
Tilia Europea	7
Torreya Californica	6
Ulex Europea	140
Ulmus suberosa	17
Ulmus montana	1
Veronica decussata	100
Veronica cœrulea	55
Veronica Andersonii	50
Veronica Andersonii variegata	60
Viburnum tinus	2
Yucca aloifolia	1
Yucca variegata	12
Yucca Whippleii	150
Yucca filamentosa	2
Total	43,447

FLOWERING AND HERBACEOUS PLANTS PLANTED DURING YEAR 1894-95

Alternanthera amabilis	1,300
Alternanthera aurea-nana	19,200
Alternanthera versicolor	6,200
Alternanthera paryenchoides	16,200
Alternanthera aurea major	5,000
Alternanthera aurea	5,600
Anemone Japonica alba	200
Anemone Japonica rosea	500
Anemone; European	2,400
Achyranthus Lindenii	360
Achyranthus bicolor	600
Achyranthus Collinsii	240
Achyranthus Verschaffeldtii	500
Amaranthus rubra	620
Ageratum cœrulea; dwarf	1,000
Agathea alba	350
Agathea aurea	1,220
Alyssum variegatum	1,000
Alyssum Wiesbackii	500
Asters	420
Agrostemma coccinea	1,200
Cineraria hybrida	2,460
Cosmos bipinnata	720
Coleus Verschaffeldtii	2
Canna; Mad. Crozy	150
Canna; Alphonse Bouvier	45
Centaurea candidissima	6
Centaurea gymnocarpa	192
Convolvulus minor	9
Chieranthus chieri	150
Chrysanthemum; Etoile d'Or	232
Chrysanthemum carnatum	560
Chrysanthemum	1,000
Campanula calycanthema	200
Cuphea platycentra	100
Convallaria majalis	500
Dahlia; cactus	1,350
Dahlia; Nymphea	3

FLOWERING AND HERBACEOUS PLANTS PLANTED DURING YEAR 1894-95—Continued.

Dahlia; Tom Thumb	10
Dahlia hybrida	872
Delphinum cardiopetalum	800
Dianthus barbatus	540
Digitalis purpurea	4,200
Eschscholtzia Californica	300
Fuchsias	74
Gnaphalium lanatum	166
Geraniums in variety	4,946
Geraniums zonale	1,764
Helianthus Californica	720
Helianthus; dwarf	1,050
Hibiscus Reevesii	1,094
Hibiscus macrophylla	6
Heliotropeum Peruvianum	12
Hydrangea Hortensia	93
Hypericum calycinum	800
Hypericum Moserianum	2
Hypericum patulum	50
Iberis alba	50
Lobelia cardinalis	280
Lobelia speciosa	3,700
Leptosyne maritima	480
Myosotis palustris	6,300
Mesembryanthemum cordifolium	1,360
Mesembryanthemum crystallinum	200
Nasturtiums	500
Œnothera Lamarkiana	200
Oxalis rosea	15,000
Oxalis lutea	50
Papaver; oriental	360
Papaver; Bracteatum	150
Papaver; Segisterum	1,690
Papaver; Shirley	600
Papaver phœas; Shirley	90
Papaver; Persian	75
Papaver; Iceland	2,380
Penstemon centrathifolia	750
Penstemon atro-purpurens	550
Petunia hybrida, in variety	630
Petunia grandiflora	214
Pansies, in variety	8,500
Primula variabilis	1,000
Pelargonium zonale	900
Pelargonium peltatum	50
Rudbeckia grandiflora	2,500
Romneya Californica	12
Spergula pilifera	50,000
Silene compacta	800
Silene pendula rosea	3,000
Stocks	350
Solanum argenteum	2
Thymus elegantissimum	3,120
Thymus aurea	1,500
Thymus silver	15,000
Tritonia crocosmiflora	5,000
Viola cornuta	3,130
Viola lutea	1,150
Viola white	30
Viola tricolor	6,370
Violet; "The California"	1,950
Violet; Marie Louise	4,500
Violet; The Czar	3,000
Violet; Swanley white	800
Vinca major	2,000
Vinca major variegata	100
Total	240,161

VINES PLANTED IN PARK FROM JULY 1, 1894, TO JULY 1, 1895.

Ampelopsis Veitchii	30
Ampelopsis Royalii	22
Bignonia Australis	1
Bignonia Tweediana	2
Convolvulus major	6
Clematis tigusticifa	34
Clematis Jackmanii	12
Clematis flamula	6
Clematis paniculata	12
Dolichos lablab	138
Eccremocarpus scabra	28
Hedera helix aurantiaca	2
Kennedya rubicunda	1
Kennedya monophylla	1
Lonicera rubra	50
Lonicera Japonica var.	650
Lonicera grandiflora	436
Lonicera tatarica splendens	575
Lonicera perclymenum	360
Lonicera symphoricarpus	50
Lophospermum scandens	60
Linaria cymbalaria	170
Mandevilla suaveolens	6
Mina lobata	4
Nasturtiums	160
Periploca glauca	6
Passiflora cœrulea	45
Passiflora alba	34
Passiflora; Constance Elliott	12
Phaseolus atro-purpurea	12
Ribes alpinum pumilum aureum	1
Streptosolon Jamesii	4
Tacsonia rubra	50
Tacsonia rosea	125
Tacsonia princeps	30
Tecoma jasminoides	6
Wistaria sinensis	1
Wistaria fruticans	1
Total	3,143

BULBS PLANTED IN PARK FROM JULY 1, 1894, TO JULY 1, 1895.

Anemone coronaria	2,500
Anemone palmata	25
Gladiolus	20
Hyacinths; single	876
Hyacinths; double	628
Lilium auratum	170
Lilium speciosum rubrum	50
Lilium speciosum Melopomene	50
Montbretia elegans	3,000
Oxalis lutea; single	50
Ranunculus vulgaris	500
Tulips; single	789
Tulips; double	2,000
Watsonia coccinea	100
Total	10,308

PALMS PLANTED IN PARK FROM JULY 1, 1894, TO JULY 1, 1895.

Brahea filamentosa	2
Bambusa Japonica	25
Chamærops excelsa	3
Dracæna Australis	151
Dracæna Fosterii	1
Pritchardia Pacifica	2
Phœnix Canariensis	2
Phœnix reclinata	2
Total	189

TREES AND SHRUBS IN PARK NURSERY.

Abies concolor	6
Abies amabilis	140
Abies magnifica	3
Abies nigra	30
Abies alba	36
Abies Douglassii	1,450
Abies Mertensiana	500
Abies Menziesii	150
Abies Williamsonii	50
Abies grandis	1,000
Abies nobilis	50
Abies lasiocarpa	200
Acacia armata	106
Acacia dealbata	15
Acacia decurrens	15
Acacia fragrans	1,280
Acacia latifolia	5,350
Acacia lophantha	1,680
Acacia melanoxylon	320
Acacia mollissima	320
Acacia pycnantha	8
Acacia verticillata	900
Acacia Riceana	102
Acacia salicina	23
Acacia capensis	6
Acacia juniperus	3
Acacia horrida	46
Acacia longifolia	3
Acacia coccinea	25
Acacia discolor	4
Acacia coulteriformis	3
Acacia calamistrata	6
Acacia Persiana	2
Acer macrophyllum	4
Arctostaphylos pungens	3
Arundinaria falcata	10
Azara macrophylla	6
Amygdalus amarus	2
Azalea occidentalis	300
Antigonon Mexicanum	12
Aloysia citriodora	30
Arbutus unedo	11
Arbutus Menziesii	80
Ancuba Japonica	150
Abutilon; yellow	60
Abutilon; white	50
Abutilon; red	75
Abutilon Thompsonii var.	68
Abutilon vexillaria	150
Acer pseudo-platanoides	4
Acer glaucum	12
Araucaria excelsa	4
Araucaria imbricata	630
Araucaria Bidwellii	16
Achania malvaviscus	84
Æsculus glabra	3
Æsculus Californica	34
Bronsonetia populiferæ	4
Boldoa fragrans	3
Betula alba	22
Bouvardia alba	3
Buddleya globosa	75
Benthamia frangifera	20
Brugmansia suaveolens	50
Buxus sempervirens	568
Bambusa aurea	75
Berberis vulgaris	255
Berberis Darwinii	150
Berberis stenophylla	9
Berberis capitatus	2
Bambusa taiho	10
Bupleurum fruticosum	5
Callistemon lanceolata	15
Callistemon rugulosis	18
Callistemon suaveolens	46
Callitris cupressiformis	26
Calycanthus Florida	5
Calycanthus occidentalis	350
Camellia Japonica	49
Cassia floribunda	45
Cassia coryambosa	12
Casuarina quadrivalvus	1,100
Casuarina glauca	200
Casuarina equisetifolia	350
Celtus cordata	94
Cestrum aurantiacum	8
Cistus alba	280
Cistus rosea	85
Cistus ladaniferus	60
Cistus salviafolius	70
Clerodendron speciosum	6
Clianthus puniceus	275
Coprosma Baueriana	322
Coprosma var.	6
Cornus pubescens	1
Coronilla glauca	8
Cryptomeria elegans	12
Cryptomeria Japonica	123
Callicoma serratifolia	4
Cercis siliquastrum	10
Cratægus oxyacantha	65
Cupressus Lawsoniana	1,950
Cupressus macrocarpa	8,400
Cupressus Goveniana	625
Cupressus MacNabiana	36
Cupressus torulosa	180
Cupressus sempervirens	108
Cupressus Knightii pendula	4
Cupressus Knightiana	35
Cotoneaster buxifolia	350
Corynocarpus lævigatus	27
Colletia ferox	60
Cerasus laurus	4
Cedrus Atlantica	50
Cedrus Libani	10
Cedrus deodara	35
Ceanothus integerrimus	18
Ceanothus prostratus	5
Ceanothus Africana	2,000
Ceanothus Californica	120
Cytisus bullatus	60
Cytisus capitatus	24
Cytisus laburnum	64
Cytisus purpurea	10
Cytisus quercifolia	107
Cytisus triflorus	27

Trees and Shrubs in Park Nursery—Continued.

Cytisus hirsutus	930
Cytisus sessilifolius	28
Cytisus elaborata	1,400
Cytisus Canariensis	480
Cytisus elongatus	160
Cytisus spinosa	320
Calliandra	6
Chamærops excelsa	25
Chamærops humilis	6
Colquhounia Harrisii	5
Colquhounia tomentosa	1
Choisea ternata	12
Duranta Plumerii	8
Dryandra blecknifolia	12
Dracæna Australis	1,080
Dracæna nutans	27
Deutzia canescens	56
Deutzia crenata floraplena	250
Deutzia gracilis	250
Deutzia fortunei	80
Diosma alba	350
Diosma purpurea	175
Diosma ericifolia	150
Deeringea celosoides	25
Diplopappus chrysophylla	75
Datura arborea	30
Daphne indica variegata	26
Eucalyptus discolor	2
Eucalyptus obcordia	1
Eucalyptus myrtifolia	1
Eucalyptus cornuta	1
Eucalyptus cedanoxylon	1
Eucalyptus amplifolia	4
Eucalyptus robusta	15
Eucalyptus amygdalina	38
Eucalyptus citriodora	2
Eucalyptus vitellina	90
Eucalyptus Stuartiana	155
Eucalyptus coccifera	125
Eucalyptus Gunnii	212
Eucalyptus urinigera	15
Eucalyptus peperita	2
Eucalyptus globulus	33
Eucalyptus polyanthemos	25
Eucalyptus obliqua	8
Eucalyptus viminalis	165
Eucalyptus saligna	23
Eucalyptus cineria	1
Eucalyptus cosmophylla	2
Eucalyptus exserta	2
Eucalyptus radiata	2
Eucalyptus florabunda	2
Eucalyptus fissilis	2
Eucalyptus gigantea	5
Eucalyptus leucoxylon	3
Eucalyptus melliodora	2
Eucalyptus Muellerii	125
Epacum Indostua Zoyalinii	30
Entelea arborescens	27
Eleagnus aurea	12
Eleagnus angustifolia	3
Edwardsia microphylla	222
Erica arborea	250
Erica Mediterranea	650
Erythrina crista-galli	5
Escalonia alba	15
Escalonia rubra	550
Escalonia macrantha	420
Escalonia Philipiana	14
Eugenia latifolia	15
Eugenia myrtifolia	13
Eupatorium pinnata	25
Eupatorium Dishii	40
Eurybia Australis	12
Euonymus Japonica	480
Euonymus aurea	260
Euonymus radicans	85
Euonymus variegata	170
Ficus repens	1
Ficus indica	2
Ficus carica	4
Fabiana imbricata	2
Fraxinus accuminata	3
Fraxinus dimorpha	20
Fremontia Californica	9
Frenela robusta	3
Fagus sylvatica	5
Genista alba	4,900
Genista andreana	1
Genista candicans	200
Genista tinctoria	500
Genista linifolia	200
Grevillea robusta	2
Ginko biloba	5
Guerina avellana	2
Goodia latifolia	70
Habrothamnus coccinea	460
Habrothamnus elegans	380
Hibiscus alba	12
Hibiscus splendens	5
Hardenbergia alba	3
Hardenbergia monophylla	1
Hypericum calycinum	350
Hypericum flavum	2
Hypericum patulum	120
Hema grandiflora	106
Hakea auricularis	4
Indigofera Australis	60
Isochroma tubulosa	12
Isochroma coccinea	85
Ilex aquifolia	172
Ilex aquifolia aurea	2
Ilex argentea alba	2
Jasminum fruticans	250
Jasminum grandiflorum	3
Juglans Japonica	2
Juglans Sieboldii	4
Juniperus	20
Juniperus Chinensis	7
Juniperus drupacea	6
Juniperus fragrans	7
Juniperus Bermudiana	8
Juniperus prostrata	215
Juniperus communis	26
Juniperus Sabina	6
Juniperus compacta	450
Juniperus lycea	35
Juniperus Hibernica	25
Juniperus Japonica	50
Juniperus Japonica variegata	176
Juniperus Virginiana	30
Jacaranda mimosæfolia	6
Kolreuteria paniculata	12
Latania Borbonica	6
Laurus camphora	1
Laurus nobilis	6
Laurus lusitanica	450
Lavendula spica	2
Leonotis leonaria	2
Leptospermum ericifolia	1,100
Leptospermum lævigatum	1,400
Libocedrus decurrens	18
Libonia florabunda	150
Leucodendron argenteum	3
Liriodendron tulipifera	12
Ligustrum Californicum	6

TREES AND SHRUBS IN PARK NURSERY—Continued.

Ligustrum variegata	12
Ligustrum Japonicum	350
Lycium parviflorum	20
Murraya exotica	12
Manettia cordifolia	8
Morus alba	27
Mimosa julibrissima	3
Maclura aurantiaca	60
Magnolia grandiflora	112
Mandevilla suaveolens	6
Melaleuca decussata	410
Melianthus major	3
Metrosideros solonisis	15
Menziesia ferriguinea	2
Myoporum maculatum	125
Melia azederack	12
Myrtus communis	12
Myrtus latifolia	100
Myrtus mucronata	120
Mespilus Japonica	12
Nandina domestica	2
Negundo aceroides	7
Nierembergia gracilis	4
Olea sativa	360
Periploca græca	4
Phœnix Canariensis	600
Pimelia rosea	175
Podalyria argentea	4
Protea nerifolia	1
Polygonum sacalense	15
Phormium tenax	40
Pritchardia Pacifica	170
Prunus aquifolia	600
Philadelphus coronaria	150
Phillyrea latifolia	75
Phillyrea ilicifolia	20
Photinia arbutifolia	12
Pittosporum eugeneoides	1,700
Pittosporum crassifolium	329
Pittosporum tobira	26
Pittosporum tobira var.	31
Pittosporum undulatum	26
Pittosporum nigrum	750
Pittosporum Buchananii	5
Platanus racemosus	7
Plumbago capensis	55
Polygala Dalmasiana	250
Polygala alternata	5
Polygala grandiflora	9
Pomaderris leviginea	2
Ptelia trifoliata	31
Pavonia hastata	12
Phebaleum dentatum	1
Pyrus Japonica	6
Pyrus malus	12
Pinus Jeffreyi	26
Pinus Canariensis	7
Pinus Labiniana	5
Pinus Parryana	9
Pinus mugho	2
Pinus Coulterii	239
Pinus excelsa	56
Pinus albicaulis	150
Pinus Halepensis	284
Pinus insignis	4,560
Pinus longifolia	3
Pinus maritima	2,400
Pinus monticola	309
Pinus muricata	1,108
Pinus pinea	39
Pinus ponderosa	920
Pinus rubra	8
Pinus strobus	25
Pinus Sabiniana	107
Pinus Torreyana	216
Pinus Lambertiana	209
Pinus Austriaca	21
Pinus Sylvestris	13
Pinus Bermudiana	11
Pinus Murrayana	10
Pinus tuberculata	35
Picea bracteata	24
Picea grandis	120
Picea magnifica	50
Picea pungens	250
Picea Sitkensis	1,000
Picea mariana	800
Picea Engelmannii	400
Quercus robur	86
Quercus suberosa	10
Quercus densiflora	3
Quercus palmira	45
Quercus Humboldtii	4
Quercus palustris	10
Quercus ilex	11
Quercus Douglassii	70
Quercus lobata	30
Quercus virens	35
Quercus phelos	45
Quercus bullata	25
Rhamnus integrifolius	5
Rhamnus alpinus	35
Rhamnus catharticus	10
Rhamnus Californica	25
Rhamnus frangula	16
Rhamnus Purschiana	4
Rhamnus infectorius	1
Rhus integrifolia	8
Robinia fastigiata	45
Romneya Coulterii	45
Rivina humilis	13
Ricinus pulcherrima	6
Ribes alpinum	1
Raphiolepis ovata	250
Ruscus aculiatus	100
Rhododendron Californicum	2,100
Rhododendron arboreum	52
Retinospora obtusa aurea	75
Retinospora plumosa	2
Solanum capsicastrum	38
Solanum macrocarpa	40
Solanum robustum	60
Spiræa palmata	6
Sequoia gigantea	850
Sequoia sempervirens	123
Salix vitellina	2,000
Salix pendula	6
Salix Kilmarnock	5
Schotia latifolia	1
Stevia serrata	8
Sollya heterophylla	27
Swainsonia rubra	75
Swainsonia alba	2
Schinus molle	136
Schinus terebinthefolia	60
Syringa vulgaris	12
Staphylea pinnata	2
Salisburia adiantifolia	3
Sambucus aurea	2
Syncarpia laurifolia	2
Sida pulchella	1
Spartium junceum	40
Taxodium distychium	2
Taxus baccata	12
Thuja gigantea	2,450
Thuja occidentalis	12

TREES AND SHRUBS IN PARK NURSERY—Continued.

Thuja tartarica	8	Veronica; dwarf blue	1,600
Thujopsis dolobrata	39	Veronica decussata	118
Templetonia retusa	4	Veronica elliptica	350
Thalictrum foliosum	8	Veronica paniculata	45
Tilia Europea	4	Veronica salicifolia	208
Tsuga Pattoniana	100	Vitis agnus castus	3
Ulex Europea	125	Weigela rosea	220
Ulmus montana	6	Weigela rubra	12
Viburnum lucidum	60	Wistaria sinensis	6
Viburnum opulus	145	Wistaria fruticosa	8
Viburnum tinus	175	Wigandia macrophylla	2
Veronica Andersonii	82		
Veronica Andersonii var.	205	Total	90,371

FLOWERING PLANTS IN PARK NURSERY.

Agrostemma coronarium	50	Mesembryanthemum crystallinum	60
Aquilegia chrysantha	150	Mesembryanthemum cordifolium var.	1,500
Antirrhinum major	400	Mathiola hybrida	360
Ageratum Mexicanum	2,000	Nicotiana affinus	15
Achyranthus Lindenii	1,600	Œnothera grandiflora	640
Alternanthera amæna	80	Pyrethrum aureum	2,000
Agathea cœlestris	25	Pyrethrum uliginosa	7
Chrysanthemum carnata	300	Papaver; Shirley	160
Commelina cœlestris	160	Phlox Drummondii	300
Cosmos bipinnata alba	30	Pentstemon centranthifolia	450
Cosmos bipinnata rubra	600	Polyanthus tuberosa	60
Campanula media	30	Rudbeckia grandiflora	960
Chieranthus chieri	1,000	Salpiglossis; large flowering	1,000
Digitalis lutea	360	Sedum azoricum	120
Dianthus barbatus	1,200	Saxifraga cordifolia	120
Echium Lindleyana	125	Statice holfordia	120
Echium argenteum	25	Salvia splendens	900
Fuchsia fulgens	25	Tritoma uvaria	1,500
Gnaphalium lanatum	150	Thymus vulgaris alba	6,000
Hydrangea Hortensea	520	Thymus vulgaris aurea	4,000
Helianthus Californica	240	Verbena; in variety	12
Iberis sempervirens	12	Wigandia macrophylla	2
Lobelia speciosa	4,000		
Lobelia var.	300	Total	33,668

VINES IN PARK NURSERY.

Ampelopsis Veitchii	18	Lonicera Japanese	60
Ampelopsis quinquifolia	45	Lonicera grandiflora	120
Aristolochia elegans	26	Lonicera chamæcerasus	115
Bignonia Tweediana	3	Lophospermum scandens	220
Bignonia Australis	8	Maurandia Barclayana	4
Bignonia Thunbergiana	7	Maurandia rubra	20
Cuphea elegans	1	Maurandia alba	6
Cuphea platycentra	25	Passiflora cœrulea	340
Clematis paniculata	150	Passiflora princeps	400
Cobea scandens	112	Phaseolus-caracala	9
Dolichus lablab	60	Tecoma jasminoides	120
Eccremocarpus scabra	45	Tecoma radicans	24
Hedera helix aurantiaca	25	Tacsonia Van Volexina	450
Ipomea cœrulea	20	Vitis Californica	100
Kennedya rubicunda	1	Wistaria sinensis	6
Kennedya Marryata	1		
Lonicera Californica	20	Total	2,686
Lonicera caprifolium	125		

CATALOGUE OF TREES AND SHRUBS IN GOLDEN GATE PARK.

Abies cephalonica.
Abies Douglassii.
Abies Menziesii.
Abies Mertensiana.
Abies nigra.
Abies Hookeriana.
Abies alba.
Abies grandis.
Abies morinda.
Abies pumila.
Abies pyramidalis.
Abies firma.
Abies amabilis.
Abies concolor.
Abies nobilis.
Abies magnifica.
Abutilon Thomsonii.
Abutilon; Boule de Neige.
Abutilon vexilaria.
Abutilon striatum.
Abutilon aurea.
Abutilon Thomsonii var.
Abelia rupestris.
Acacia armata.
Acacia decurrens.
Acacia dealbata.
Acacia cultriformis.
Acacia fragrans.
Acacia floribunda.
Acacia implexa.
Acacia latifolia.
Acacia lophantha.
Acacia linearis.
Acacia melanoxylon.
Acacia mollissima.
Acacia pycnantha.
Acacia Farnesiana.
Acacia homotophylla.
Acacia verticillata.
Acacia paradoxa.
Acacia Riceana.
Acacia salicina.
Acacia flexiosa.
Acacia citriodora.
Acacia cuneata.
Acacia longifolia.
Acacia coccinea.
Acacia aulocarpa.
Acacia discolor.
Acacia coulteriformis.
Acacia salamistrata.
Acacia myrtifolia.
Acacia Persiana.
Acacia stenophylla.
Acer Schwedlerii.
Acer tartaricum.
Acer rubrum.
Acer pseudo-platanus purpura.
Acer campestris.
Acer dasycarpium.
Acer macrophyllum.
Acer platanoides.
Acer saccharinum.
Acer polymorphum.
Achania malvaviscus.
Æsculus Californica.
Æsculus hippocastanum.
Æsculus pavia.
Æsculus glabra.
Æsculus rubicunda.
Æsculus Japonica.
Albizzia lophantha.
Alnus serrulata.
Aloysia citriodora.
Ailanthus glandulosa.
Amorpha crocea lanata.
Amorpha Lewisii.
Amorpha fragrans nana.
Amorpha fruticosa.
Ampelopsis quinquifolia.
Ampelopsis Veitchii.
Amygdalus communis.
Amygdalus purpurea.
Anona cherimolia.
Anona triloba.
Aphilandra aurantiaca.
Aralia papyrifera.
Aralia Seiboldii.
Aralia spinosa.
Araucaria Bidwellii.
Araucaria Cookii.
Araucaria imbricata.
Araucaria excelsa.
Arbutus unedo.
Arbutus Menziesii.
Aristoclochia sipho.
Armeria formosa.
Artemesia glauca.
Aucuba Japonica.
Azara macrophylla.
Baccharis Douglassii.
Bambusa falcata.
Bambusa fortunei.
Bambusa arundinacea.
Bambusa metak.
Bambusa nigra.
Bambusa Simonii.
Bambusa aurea.
Bambusa aurea striata.
Banksia Cunninghamii.
Banksia grandis.
Berberis vulgaris.
Berberis Darwinii.
Berberis dulcis.
Berberis stenophylla.
Berberis nervosa.
Berberis Japonica.
Berberis Thunbergii.
Bauhinia purpurea.
Betula lenta.
Betula alba.
Betula laciniata.
Betula papyrifera.
Betula populifolia.
Betula pendula.
Bignonia radicans.
Bignonia jasminoides.
Bocconia Japonica.
Bouvardia fragrans.
Boldoa fragrans.
Brahea filamentosa.
Brahea Mannii.
Brahea sonorea.
Brugmansia suaveolens.
Buddleya globosa.
Buxus sempervirens.
Buxus argentea.
Buxus chrysophylla.
Buxus lucida.
Buxus coriacea.
Buxus altissima.
Buxus myrtifolia.
Buxus suffruticosa.
Callistris cupressiformis conifer.
Callistemon saligna.
Callistemon lanceolata.
Callistemon rugulosis.
Callistemon linearis.
Callistemon brachyandrus.
Calycanthus floridus.
Calothamnus purpurea.
Calothamnus quadripedus.
Calystachys lanceolata.
Camellia Japonica.
Carya olivæformis.
Cassia corymbosa.
Cassia floribunda.
Caragana altagana.
Casuarina stricta.
Casuarina suberosa.
Casuarina glauca.
Casuarina equisetæfolia
Catalpa bignonoides.
Catalpa Kæmferii.
Ceanothus Africana.
Ceanothus Californica.
Ceanothus azureus.
Cedrus Libani.
Cedrus deodara.
Cedrus Atlantica.
Celtus occidentalis.
Celtus cordata.
Cerasus mollis.
Cerasus laurus cerasus.
Ceratonia saliqua.
Cercis Canadensis.
Cercis siliquastrum.
Cestrum aurantiacum.
Chamærops excelsa.
Chamærops humilis.
Chionanthus Virginicus.
Choisea ternata.
Cistus ladaniferus.
Cistus maculata.
Cistus rosea.
Cistus salviafolius.
Cistus albidus.
Cistus florabunda.
Citrus aurantiaca.
Citrus Chinensis.
Citrus trifoliata.
Clematis aristata.
Clematis coccinea.
Clematis Jackmanii.
Clematis paniculatum.
Clerodendron speciosum.
Clianthus Damperii.
Clianthus puniceus.
Cobea scandens.
Coccoloba platyclada.
Colletia ferox.
Coprosma Baueriana.
Coprosma variegata.
Colutea cruenta.
Cordyline indivisa.
Cordyline Australis.
Coriaria myrtifolia.
Cornus Coulterii.
Cornus pubescens.
Cornus sanguinea.
Coronilla glauca.
Corylus Americana.
Corypha Australis.
Corynocarpus lævigatus.
Cotoneaster buxifolia.
Cotoneaster thymifolia.
Cratægus oxyacantha.
Cratægus pyracantha.

Catalogue of Trees and Shrubs in Golden Gate Park—Continued.

Crymptomeria elegans.
Crymptomeria Japonica.
Calluna vulgaris.
Cupressus argentea.
Cupressus MacNabiana glauca.
Cupressus Braziliense.
Cupressus Guadalupensis.
Cupressus macrocarpa.
Cupressus Lawsoniana.
Cupressus pyramidalis.
Cupressus funebris.
Cupressus pendula glauca.
Cupressus torulosa.
Cupressus Chinensis.
Cydonia Japonica.
Cytisus alpina.
Cytisus scoparius.
Cytisus laburnum.
Cytisus hirsutus.
Cytisus Arizonica.
Cytisus bullatus.
Cytisus capitatus.
Cytisus Californica.
Cytisus Canariensis.
Cytisus elongatus.
Cytisus spinosa.
Cytisus elaborata.
Cytisus quercifolia.
Cytisus sessiliflora.
Dammara Australis.
Daphne indica.
Daphne variegata.
Daphne laurifolia.
Daphne odorata.
Datura arborea.
Deutzia crenata floraplena.
Deutzia scabra floraplena.
Deutzia gracilis.
Diplopappus chrysophylla.
Dictamnus fraxinella.
Deeringea celosoides.
Deeringea celosoides var.
Diospora Virginiana.
Diervillea speciosa.
Dioscorea batata.
Diosma tenuifolia.
Diosma capitata.
Diosma ericifolia.
Diosma alba.
Dipsacus pulonum.
Dolichos lablab.
Dracæna Australis.
Dracæna nutans.
Dracæna stricta.
Duranta Plumerii.
Eleagnus aurea.
Eccremocarpus scabra.
Echium Lindleyana.
Echium strictum.
Echium argenteum.
Echium candicans.
Edwardsia microphylla.
Erica arborea.
Erica Mediterranea.
Erica hymalis.
Erythrina crista-galli.
Escalonia floribunda.
Escalonia macrantha.
Escalonia rubra.
Escalonia montevidensis.
Escalonia Philipiana.
Eucalyptus amygdalina.
Eucalyptus citriodora.
Eucalyptus corymbosa.
Eucalyptus globulus.
Eucalyptus goniocalix.
Eucalyptus peperita.
Eucalyptus pauciflora.
Eucalyptus polyanthemos.
Eucalyptus Pressii.
Eucalyptus rostrata.
Eucalyptus Risdonii.
Eucalyptus obliqua.
Eucalyptus paniculatus.
Eucalyptus stricta.
Eucalyptus vittata.
Eucalyptus viminalis.
Eucalyptus saligna.
Eucalyptus cordata.
Eucalyptus cineria.
Eucalyptus cosmophylla.
Eucalyptus collosea.
Eucalyptus concolor.
Eucalyptus calophylla.
Eucalyptus coccifera.
Eucalyptus exima.
Eucalyptus exserta.
Eucalyptus eugeneoides.
Eucalyptus piluderis.
Eucalyptus radiata.
Eucalyptus florabunda.
Eucalyptus fissilis.
Eucalyptus gigantea.
Eucalyptus hemiphlœa.
Eucalyptus hæmastoma.
Eucalyptus leptopleba.
Eucalyptus longifolia.
Eucalyptus leucoxlyon.
Eucalyptus melliodora.
Eucalyptus macrocarpa.
Eucalyptus macroshyncha.
Eucalyptus Muellerii.
Eucalyptus megacarpa.
Eucalyptus maculata.
Eucalyptus occidentalis.
Eugenia latifolia.
Euonymus Japonica.
Euonymus aurea.
Euonymus radicans var.
Euonymus argentea.
Euphorbia variegata.
Eupatorium ageratoides.
Exochordia grandiflora.
Fabiana imbricata.
Fagus sylvatica.
Fagus purpurea.
Ficus elastica.
Ficus carica.
Ficus macrophylla.
Ficus repens.
Forsythia viridissima.
Fraxinus excelsa.
Fraxinus acumenata.
Fraxinus ornus.
Fraxinus Oregonia.
Fraxinus pendula.
Fraxinus pendula aurea.
Frenela Australis.
Frenela rhomboides.
Frenela robusta.
Frenela Muellerii.
Galium aparine.
Genista linifolium.
Genista tinctoria.
Genista scoparia.
Genista candicans.
Geitonoplesium cymosum.
Gleditschia triacantha.
Goodia latifolia.
Goodia medicaginea.
Grevillea robusta.
Grevillea Hertii.
Gymnocladus Canadensis.
Guerina avellana.
Habrothamnus elegans.
Habrothamnus coccinea.
Hakea salicina.
Hakea auricularis.
Hakea ulicina.
Hakea leucaptera.
Hakea modosa.
Hakea verrucosa.
Hardenbergia monophylla.
Hedera felix.
Hedera variegata.
Hemia grandiflora.
Helianthemum roseum.
Hibiscus pungens.
Hibiscus syriacus.
Hibiscus macrophylla.
Hibiscus mutabilis.
Hibiscus rosea.
Hibiscus Reevesii.
Hibiscus splendens.
Hydrangea paniculata.
Hymenosporum flavum.
Hypericum Canariensis.
Hypericum calycinum.
Hypericum Moserianum.
Hypericum patulum.
Indigofera Australis.
Indigofera tinctoria.
Iacoma speciosa.
Inga dulcis.
Isochroma tubulosa.
Isochroma coccinea.
Ilex aquifolia.
Ilex Japonica.
Ilex latifolia.
Ilex aquifolia aurea.
Ilex aquifolia alba.
Jacaranda mimosæfolia.
Jasminum aurea.
Jasminum alba.
Jasminum fruticosum.
Jasminum capensis.
Juglans regia.
Juglans nigra.
Juglans Californica.
Juniperus Bermudiana.
Juniperus Phœnicia.
Juniperus Japonica alba.
Juniperus prostrata.
Juniperus communis.
Juniperus squamosa.
Juniperus Sabina.
Juniperus compacta.
Juniperus lycea.
Juniperus Hibernica.
Juniperus densa.
Juniperus Japonica.
Juniperus Japonica variegata.
Juniperus Virginiana.
Kennedya macrophylla.
Kennedya Comptoniana.
Kerria Japonica.
Kolreuteria paniculata.
Latania superba.
Larix Europea.
Larix occidentalis.
Lagerstrœmia indica.

Catalogue of Trees and Shrubs in Golden Gate Park—Continued.

Laurus camphora.
Laurus grandulosa.
Laurus indica.
Laurus nobilis.
Laurus lusitanica.
Lavatera arborea.
Lavatera arborea variegata.
Lavendula spica.
Lavendula stæchas.
Leonotis leonaria.
Leptospermum ericifolia.
Leptospermum lævigatum.
Leptospermum scoparia.
Libocedrus decurrens.
Libonia floribunda.
Leucodendron argenteum.
Liriodendron tulipifera.
Ligustrum Californicum.
Ligustrum Japonicum.
Ligustrum vulgaris.
Lonicera brachypoda.
Lonicera caprifolia.
Lonicera chamæcerasus alba.
Lonicera cornicularis.
Lonicera Californica.
Lonicera grandifloris.
Lonicera Japonica.
Lonicera pulcherrima.
Lonicera rubra.
Lonicera tartarica splendens.
Lycium parviflorum.
Liatris penostachya.
Lotus corniculatum.
Lotus tetragonolobus.
Maclura aurantiaca.
Magnolia grandiflora.
Magnolia soulangeana gracilis.
Mahania aquifolia.
Mahania odorata.
Mandevilla suaveolens.
Maytenus Chilensis.
Melaleuca armellaris.
Melaleuca ericifolia.
Melaleuca hypericifolia.
Melaleuca parviflora.
Melaleuca incana.
Melaleuca genistifolia.
Melianthus major.
Menziesia ferriguinea.
Mespilus Japonica.
Metrosideros tomentosa.
Morus alba.
Morus Japonica.
Morus nigra.
Morus multicaulis.
Morus multicaulis pendula.
Murraya exotica.
Myoporum maculata.
Myrica Californica.
Myrsiphyllum asparagoides.
Melia azederack.
Myrtus communis.
Myrtus latifolia.
Nandina domestica.
Negundo malinifolia.
Negundo aceroides.
Nerium splendens.
Nerium alba.
Neirembergia gracilis.
Netera depressa.
Nolene Beldenoi.
Olea sativa.
Olea Picolina.
Olearia ilicifolia.

Paulownia imperialis.
Philadelphus coronaria.
Philadelphus montana.
Phillyrea latifolia.
Phillyrea ilicifolia.
Phœnix dactylifera.
Photinia serrulata.
Picea amabilis.
Picea magnifica.
Picea Nordmanniana.
Picea pinsapo.
Picea concolor.
Picea pectinata.
Picea sub-alpina.
Pimelia rosea.
Pinus cembra.
Pinus Coulterii.
Pinus densiflora.
Pinus excelsa.
Pinus Hamiltonii.
Pinus Halepensis.
Pinus Jeffreyana.
Pinus laricio.
Pinus laricio calabrica.
Pinus insignis.
Pinus longifolia.
Pinus maritima.
Pinus Massoniana.
Pinus mitis.
Pinus monticola.
Pinus muricata.
Pinus mugho.
Pinus Montezuma.
Pinus pinea.
Pinus ponderosa.
Pinus rubra.
Pinus strobus.
Pinus Sabiniana.
Pinus Tæda.
Pinus inops.
Pinus radiata.
Pinus tomentosa.
Pinus parviflora.
Pinus Torreyana.
Pinus Lambertiana.
Pinus Austriaca.
Pinus Sylvestris.
Pinus albicaulis.
Pinus Bermudiana.
Pinus contorta.
Pinus Canariensis.
Pinus Fremontiana.
Pinus Murrayana.
Pinus tuberculata.
Pinus Banksiana.
Pinus pinaster.
Pittosporum eugeneoides.
Pittosporum crassifolium.
Pittosporum rhombifolium.
Pittosporum eriocarpum.
Pittosporum nigrum.
Pittosporum Buchananii.
Pittosporum tobira.
Pittosporum tobira var.
Pittosporum undulatum.
Pistacia vera.
Planera cuspidata.
Platanus occidentalis.
Platanus orientalis.
Platanus racemosus.
Plumbago capensis.
Plumbago larpenta.
Poinciana pulcherrima.
Poinciana Gillesii.

Polygala Dalmasiana.
Polygala speciosa.
Populus balsamina.
Populus nigra.
Populus argentea.
Populus fastigiata.
Pomaderris aspera.
Pomaderris lanifera.
Pritchardia filifera.
Pritchardia sonorea.
Psoralea glandulosa.
Prostranthera læcanthus.
Prostranthera minea.
Prostranthera Siebercii.
Ptelea trifoliata.
Punica granatum.
Pavonia hastata.
Plagianthus Lyalli.
Personia lanceolata.
Personia linearis.
Phebaleum dentalum.
Prunus Padus.
Prunus ilicifolium.
Prunus cerasus.
Prunus myrobalanus.
Prunus triloba.
Prunus Japonica.
Prunus malus.
Phlogacanthus thrysiflorus.
Quercus robur.
Quercus suberosa.
Quercus densiflora.
Quercus cuspidata.
Quercus dentata.
Quercus sempervirens.
Quercus macrocarpa.
Quercus montana.
Quercus olivæformis.
Quercus palustris.
Quercus agrifolia.
Quercus aquatica.
Retinospora obtusa.
Retinospora ericifolia.
Retinospora squarrosa.
Retinospora plumosa.
Retinospora argentea.
Rhamnus Californica.
Rhamnus integrifolius.
Rhamnus alpinus.
Rhamnus catharticus.
Rhamnus frangula.
Rhamnus Purschiana.
Rhamnus Coulterii.
Rhamnus infectorius.
Rhaphiolepis ovata.
Rhaphiolepis indica.
Rhus copallina.
Rhus cotinus.
Rhus coriaria.
Ribes grossularia.
Ribes sanguinea.
Ribes alpinum.
Robinia pseud-acacia.
Rochea falcata.
Rosemarinus officinalis.
Rubus rosæfolius.
Rubus occidentalis.
Rubus fruticosa.
Rubus aculeatus.
Rhyncospermum jasminoides.
Rhyncospermum jasminoides variegata.
Rhododendron ponticum.
Rhododendron Catawbiense

Catalogue of Trees and Shrubs in Golden Gate Park—Continued.

Rhododendron hybridum.
Rhododendron maximum.
Rhododendron Dalhousianum.
Rhododendron nobleanum.
Rhododendron glaucum.
Rhododendron Hodgsonii.
Rhododendron Andersonii.
Rhododendron æruginosum.
Rhododendron albicans.
Rhododendron Athens.
Rhododendron aurora.
Rhododendron barbatum.
Rhododendron blandfordiæflorum.
Rhododendron calophyllum.
Rhododendron; Countess of Sefton.
Rhododendron Corajia.
Rhododendron; Duchess of Edinburgh.
Rhododendron; Duchess of Teck.
Rhododendron; Duchess of Connaught.
Rhododendron fulgens.
Rhododendron Falconerii.
Rhododendron grenadier.
Rhododendron grande.
Rhododendron Heimilicum.
Rhododendron Jennessonii
Rhododendron Jenkinsii.
Rhododendron nigrum.
Rhododendron nilagiricum.
Rhododendron occidentalis.
Rhododendron; Princess Alexandra.
Rhododendron; Queen of Dwarfs.
Rhododendron; Rosaline.
Rhododendron Sabiana.
Rhododendron Thomsonii.
Rhododendron Wightii.
Rhododendron Habbanum bicolor.
Rhododendron Thibaudiense.
Rhododendron; Emblem.
Rhododendron Zealandicum.
Rhododendron arboreum.
Rhododendron argenteum.
Rhodochitus Berehelotianus.
Salisburia adiantifolia.
Salix alba.
Salix carpia.
Salix Babylonica.
Sambucus niger.
Sambucus niger fol. argenteis.
Sambucus racemosa purpurea.
Scidioptys verticillata.
Schinus molle.
Schinus terebinthefolia.
Schotia latifolia.
Schotia tamarindifolia.
Sequoia gigantea.
Sequoia sempervirens.
Sida pulchella.
Solanum capsicastrum.
Solanum robustum.
Solanum laciniatum.
Sollya heterophylla.
Sophora Japonica.
Sophora Japonica pendula.
Spartium junceum.
Sphæralcea Caroliniana.
Spiræa palmata.
Spiræa aerifolia.
Spiræa billiardii.
Spiræa Japonica.
Spiræa Nobleii.
Spiræa opulifolia.
Spiræa plumosa.
Spiræa prunifolia.
Spiræa Reevesii.
Spiræa Thunbergii.
Sterculia lurida.
Sterculia acerifolius.
Sterculia diversifolia.
Sterculia platanifolia.
Sterculia pentagyna.
Swainsonia alba.
Swainsonia galegifolia.
Syringa vulgaris.
Syringa Persica.
Styphelia pinnata.
Syncarpia laurifolia.
Styrax Africana.
Styrax Stantsonia.
Sutherlandii pubescens.
Tamarix gallica.
Taxodium distychium.
Taxus baccata.
Taxus cuspidata.
Taxus fastigiata.
Taxus erecta stricta.
Taxus pyramidalis.
Taxus adpressa stricta.
Taxus aurea.
Taxus Cheshuntiensis.
Taxus Washingtonii.
Tecoma capensis.
Thea viridis.
Thuja gigantea.
Thuja occidentalis.
Thuja orientalis.
Thuja pendula.
Thuja tartarica.
Thujopsis dolobrata.
Thujopsis dolobrata var.
Tilia Americana.
Tilia Europea.
Tristania conferta.
Teucrium Canadense.
Taricopus spectabilis.
Templetonia retusa.
Thalictrum foliosum.
Ulex Europea.
Ulmus montana.
Ulmus Huntingtonii.
Ulmus Wheatleyii.
Ulmus purpurea.
Ulmus argentea.
Ulmus Americana.
Ulmus campestris.
Ulmus fulva.
Ulmus pendula.
Ulmus suberosa.
Veronica arborea.
Veronica carnea.
Veronica decussata.
Veronica decumbens.
Veronica elliptica.
Veronica paniculata.
Veronica parviflora.
Veronica parviflora alba.
Veronica salicifolia.
Veronica Andersonii var.
Viburnum opulus.
Viburnum tinus.
Viburnum tinus grandiflora.
Virgilia lutea.
Virgilia capensis.
Vitis agnus castus.
Weigela rosea.
Weigela rosea variegata.
Weigela rubra.
Wistaria sinensis.
Wistaria sinensis alba.
Widdringtonia cupressoides.
Wigandia macrophylla.
Xylomelum pyreforme.

GENERAL COLLECTION OF PLANTS IN CONSERVATORY.

Abutilon; Boule de Neige.
Abutilon; d'Or.
Abutilon; Cloth of Gold.
Abutilon; Sellowinianum marmoratum.
Abutilon; The Primer.
Abutilon Thomsonii.
Acalypha illustrata.
Acalypha macroyhylla.
Acalypha marginata.
Acalypha magnifica.
Achimenes, in variety.
Æschynanthus grandiflorus.
Adhatoda cydonifolia.
Allamanda nerifolia.
Allamanda Hendersonii.
Allamanda Schottii.
Allamanda Williamsii.
Alpinia nutans.
Alocasia grandis.
Alocasia macrorhiza var.
Alocasia metallica.
Alocasia Veitchii.
Amorphophallus irosus.
Ananasa sativa.
Ananasa variegata.
Anona cherimolia.
Anthurium Andreanum.
Anthurium album.
Anthurium crystallinum.
Anthurium carnea florabunda.
Anthurium cordatum.
Anthurium giganteum.
Anthurium magnificum.
Anthurium Scherzerianum.
Anthurium Scherzerianum Williamsii.
Anthurium Reynoldianum.
Aralia Veitchii.
Aralia papyrifera.
Artocarpus integrifolius.
Artocarpus incisa.
Aspidistra lurida.
Aspidistra variegata.
Ardisia crenulata.
Aristolochia elegans.
Astilbe Japonica.
Asparagus plumosus.
Asparagus plumosus nanus.
Asparagus tenuissimus.

General Collection of Plants in Conservatory—Continued.

Azalea indica, in 30 vars.
Bertolonia guttata.
Bertolonia splendens.
Begonia rex.
Begonia; Duc. de Brabant.
Begonia; Lucy Closon.
Begonia acuminata splendida.
Begonia; Armire.
Begonia augus.
Begonia; Desfontaines.
Begonia; Jules Lecocq.
Begonia; Maletta.
Begonia; Pearl.
Begonia rex; Satin Blanc.
Begonia; Countess Louis Erbody.
Begonia; Surprise.
Begonia; flowering vars.
Begonia alba picta.
Begonia argentea guttata.
Begonia florabunda rosea.
Begonia imperialis.
Begonia manicata aurea.
Begonia metallica.
Begonia olbia.
Begonia semperflorens elegans.
Begonia semperflorens alba.
Begonia rubra.
Begonia Weltoniensis.
Begonia Weltoniensis alba.
Begonia; tuberous, 150 vars.
Bignonia venusta.
Bignonia alba.
Bignonia cærulea.
Bilbergia guttata.
Bilbergia farinosa.
Bonapartia juncea.
Bougainvillea glabra.
Bougainvillea spectabilis.
Caladium argyrites.
Caladium; Adolphe Adams.
Caladium; Alfred Bleu.
Caladium; Beethoven.
Caladium Chantinii.
Caladium Chantinii splendens.
Caladium elegantissima.
Caladium; Mad. J. Picot.
Caladium; Mad. F. Vergie.
Caladium ceres.
Caladium Sedenii.
Caladium; E. G. Henderson.
Caladium; Mad. Andrae.
Caladium; Dr. Lindley.
Caladium coypel.
Caladium Virginale.
Caladium; Queen Victoria.
Caladium; Alfonse Hardy.
Caladium Verdi.
Caladium; Souvenir de Lille.
Caladium pictum.
Caladium; Mons. Hardie.
Caladium; Le Carnegie.
Caladium; Alzire.
Caladium fulgens.
Caladium; Prince Albert Edward.
Caladium; Pearl de la Brazil.
Caladium; Newmanii.
Calceolaria hybrida.
Camellia; Duchess of Orkney.
Camellia alba plena.
Camellia; C. M. Hovey.
Camellia; Sarah Frost.
Camellia fimbriata.
Camellia; Lady Hume.
Canna Ehmanii.
Canna; Mad. Crozy.
Carica papaya.
Chorizema odorata.
Cineraria hybrida.
Cissus discolor.
Clerodendron Balfourii.
Clerodendron fallax.
Clerodendron speciosa.
Coffea Arabica.
Crinum amabile.
Crinum augustina.
Crinum Powellii.
Croton illustris.
Croton irregulare.
Croton splendens.
Croton variegatus.
Croton Weismanii.
Croton interruptum aureum.
Croton recurvum.
Croton tortilis.
Croton pictum.
Croton Youngii.
Croton mortii.
Croton; Queen Victoria.
Croton Massangeanus.
Curcuglio recurvata var.
Curmeria Leopoldii.
Cyclamen persicum.
Cyclamen album.
Cyclamen Atkinsii.
Cyperus alternifolius.
Cyperus alternifolius variegatus.
Darlingtonia Californica.
Dieffenbachia Bausei.
Dieffenbachia marmorata.
Dieffenbachia picta.
Dieffenbachia Baraquiniana.
Dipladenia amabilis.
Dipladenia Brearleyana.
Dracæna Baptisii.
Dracæna Bausei.
Dracæna congesta rubra.
Dracæna Cooperii.
Dracæna ferrea.
Dracæna gracilis.
Dracæna Lindenii.
Dracæna Goldiana.
Dracæna Guilfoylei.
Dracæna splendens.
Dracæna Shepardii.
Dracæna terminalis picta.
Dracæna Jaspardsia.
Echites nutans picta.
Encephalartos villosus.
Eranthemum reticulatum.
Eranthemum sanguineum.
Eranthemum versicolor.
Eranthemum alba marginatum.
Eucharis Amazonica.
Eucharis candidum.
Eucharis Japonicum.
Euphorbia jacquiniflora.
Euphorbia scandens.
Eurycles Australasica.
Eurycles Amboyennensis.
Ficus elastica.
Ficus elastica variegata.
Ficus Cannonii.
Ficus Parcellii.
Ficus repens.
Ficus tinctoria.
Fittonia argyroneura.
Fittonia Pearceii.
Fittonia Verschaffeldtii.
Funkia odorata.
Funkia subcordata.
Franciscea Americana.
Fuchsia, in variety.
Garcinia mangostana.
Gardenia Florida.
Gardenia fortunei.
Gloxinea crassifolia erecta.
Gloxinea pendula.
Hedychium Gardnerianum.
Heliotropium Peruvianum.
Hibiscus Collerii.
Hibiscus Cooperii.
Hibiscus fulgidus.
Hibiscus Kermisinus.
Hibiscus Lambertii.
Hibiscus pleno rubra.
Hibiscus rosa sinensis.
Hibiscus schizopetalus.
Hoya bella.
Hoya carnosa.
Imantophyllum miniatum.
Impatiens Sultanii.
Isolepis gracilis.
Ixora aurora.
Ixora Williamsii.
Ixora; Prince of Orange.
Justicea carnea.
Justicea splendens.
Kæmpferia rotunda.
Lasiandra macrantha.
Lapageria alba.
Lapageria rosea.
Ligularia Kæmpferii alba.
Macadamia ternifolia
Mackaya bella.
Magnolia fuscata.
Mangifera indica.
Maranta amabilis.
Maranta nitens.
Maranta photus.
Maranta regalis.
Maranta Van Den Heckii.
Maranta vittata.
Maranta lageriana.
Maranta zebrina.
Maranta rosea picta.
Maranta Makayana.
Maranta Lindenii.
Maranta Kerchoveana.
Maranta nitida.
Maranta conspicua.
Maranta Leopoldii.
Musa zebrina.
Narcissus poeticus.
Nepenthes Chelsonii.
Nepenthes coccinea.
Nepenthes gracilis major.
Nepenthes Hookerianum.
Nepenthes insignis.
Nepenthes Raffelsiana.
Nepenthes Sedenii.
Nepenthes Mastersiana.
Nepenthes Henryana.
Nepenthes hybrida maculata.
Nepenthes dominiana.
Nepenthes sanguinea.
Nepenthes Veitchii.
Ophiopogon Jaburan aureo var.
Pancratium fragrans.

GENERAL COLLECTION OF PLANTS IN CONSERVATORY—Continued.

Pandanus Javanicus var.
Pandanus graminifolia.
Pandanus utilis.
Pandanus Veitchii.
Panicum variegatum.
Passiflora cœrulea.
Passiflora; Constance Elliott.
Passiflora edulis.
Passiflora fulgens.
Passiflora macrocarpa.
Passiflora princeps.
Passiflora quadrangularis.
Passiflora quadrangularis variegatus.
Passiflora racemosa.
Papyrus antiquorum.
Peperomia argentea.
Peristrophe angustifolia var.
Persea gratissima.
Phaseolus caracalla
Phyllanthus nivosum.
Phyllodendron Lindenii.
Phyllodendron pertusum.
Phyllodendron radiatum.
Pothos argenteus.
Primula sinensis alba.
Primula sinensis alba fl. pl.
Primula sinensis rubra.
Primula sinensis rubra fl. pl.
Primula obconica.
Poinsettia pulcherrima.
Poinsettia pulcherrima plenissima.
Ravenalia Madagascariensis.
Rivina humilis.
Rogiera gratissima.
Ruellia macrantha.
Russellia juncea.
Sanchezia nobilis grandiflora.
Sanseveria Zeylandica.
Spathiphyllum melicomæfolium.
Stephanotis floribunda.
Stigmaphyllum ciliatum.
Strelitzia augusta.
Strelitzia reginæ.
Streptocarpus polyanthafolia.
Tabernæmontana coronaria fl. pl.
Tacsonia Buchananii.
Tacsonia princeps.
Tacsonia Van Volexina.
Tecoma gracilis.
Thunbergia elata.
Thunbergia Harrisii.
Thunbergia laurifolia.
Thunbergia odorata.
Thyrsacanthus rutilans.
Torenia Asiatica.
Torenia Verschaffeldtii.
Toxicophlæa spectabilis.
Vallota purpurea.
Vinca alba.
Vinca rosea.
Vriesia splendens.
Yucca quadricolor.

ORCHIDS IN CONSERVATORY.

Acineta Barkerii.
Acineta Humboldtii.
Aerides Japonicum.
Aerides Leeanum.
Aerides odoratum cornutum.
Aerides quinquevulnerum.
Aerides viridis.
Barkeria Skinnerii.
Barkeria spectabilis.
Bletia hyacinthina.
Bletia tankervilliæ.
Brassavola glauca.
Brassavola oculata.
Brassia candida.
Brassia verrucosa.
Burlingtonia imperialis.
Burlingtonia venusta.
Calanthe discolor.
Calanthe gracilis.
Calanthe oculata.
Calanthe pleichroma.
Catasetum medium.
Cattleya amethystina.
Cattleya amethystina intermedia.
Cattleya Dowiana.
Cattleya Chocoensis.
Cattleya El Dorado.
Cattleya Gaskelliana.
Cattleya gigas.
Cattleya insignis.
Cattleya labiata.
Cattleya Mendelii.
Cattleya mossiæ.
Cattleya Percivaliana.
Cattleya Skinnerii.
Cattleya splendens.
Cattleya trianæ.
Cattleya trianæ alba.
Chysis aurea.
Cœlogyne cristata.
Cœlogyne Fostermanii.
Cœlogyne Lowii.
Cœlogyne oculata.
Cymbidium Lowianum.
Cymbidium giganteum.
Cypripedium albo purpureum.
Cypripedium barbatum.
Cypripedium insignis.
Cypripedium insignis maculata.
Cypripedium superbens.
Cypripedium collosum.
Cypripedium Curtisii.
Cypripedium Harrisianum.
Cypripedium Schlimii.
Cypripedium Pearceii.
Cypripedium Sedenii.
Cypripedium venustum.
Cypripedium Lawrenceanum.
Cypripedium Lowii.
Cypripedium Boxallii.
Cypripedium Stoneii.
Cypripedium bellatulum.
Cypripedium Godefroyæ.
Cypripedium villosum.
Cypripedium Dautherii.
Cypripedium Haynaldianum.
Cypripedium conchiferum.
Cypripedium caudatum.
Cypripedium Ashburtonæ.
Cypripedium Roezlii.
Cypripedium Domianum.
Dendrobium anguilaria.
Dendrobium cucullatum.
Dendrobium Dalhousianum.
Dendrobium speciosum Hillii.
Dendrobium Japonicum.
Dendrobium Kingianum.
Dendrobium Farmerii.
Dendrobium nobile.
Dendrobium Pierardii.
Dendrobium pulchellum.
Dendrobium superbum.
Disa grandiflora.
Epidendrum brassavolæ.
Epidendrum cinnabarinum.
Epidendrum cochleatum.
Epidendrum cuspidatum.
Epidendrum paniculatum.
Epidendrum vitellinum.
Gongora portentosa.
Gongora punctata.
Grammatophyllum Ellisii.
Lælia acuminata.
Lælia acuminata rosea.
Lælia albida.
Lælia anceps.
Lælia anceps alba.
Lælia anceps Hillii.
Lælia crispa.
Lælia Dayana.
Lælia superbens.
Leptotes bicolor.
Lycaste aromatica.
Lycaste Deppii.
Lycaste lanipes.
Lycaste Skinnerii.
Lycaste Skinnerii alba.
Masdevallia Dayana.
Masdevallia elegans.
Masdevallia citrina.
Masdevallia maculata.
Maxillaria grandiflora.
Maxillaria tenuifolia.
Mesospinidium sanguineum.
Odontoglossum cirrosum.
Odontoglossum Barkerii.
Odontoglossum citrosmum.
Odontoglossum citrosmum roseum.
Odontoglossum crispum.
Odontoglossum grande.
Odontoglossum Hallii.
Odontoglossum insleayi.
Odontoglossum piscatorei.
Odontoglossum vexillarium.
Oncidium ampliatum.
Oncidium Barkerii.
Oncidium Cavendishianum.
Oncidium cucullatum.
Oncidium leucochilum.
Oncidium flexuosum.
Oncidium ornithorrhynchum.
Oncidium papilio.
Oncidium sphacelatum.
Peristeria elata.
Phaius albus.
Phaius maculatus.
Phaius blumei.
Phalænopsis amabilis.
Phalænopsis esmeralda.

Orchids in Conservatory—Continued.

Phalænopsis grandiflora.
Phalænopsis Luddemanniana.
Phalænopsis Schillerana.
Phalænopsis Stuartiana.
Renanthera coccinea.
Saccolabium gultatum.
Saccolabium guttatum roseum.
Saccolabium blumei pulchrum.
Saccolabium retusum.
Saccolabium violaceum.
Sobralia macrantha.
Sophronitis grandiflora.
Spathoglottis aurea.
Spathoglottis fortunei.
Stanhopea aurea.
Stanhopea grandiflora.
Stanhopea insignis.
Stanhopea oculata.
Stanhopea tigrida.
Stanhopea Wardiana.
Thunia Marshalliana tricolor.
Thunia Bensonæ.
Trichopilia fragrans.
Trichopilia tortilis.
Vanda concolor.
Vanda densiflora.
Vanda guttata.
Vanda tricolor.
Vanda tricolor nebulosa.
Vanda cœrulea.
Vanda boxallii.
Vanilla aromatica.
Zygopetalum Mackayi.
Zygopetalum majus.

PALMS IN CONSERVATORY.

Areca alba.
Areca rubra.
Areca monostachya.
Areca sapida.
Areca Baueri.
Areca lutescens.
Areca Verschaffeldtii.
Caryota urens.
Cocos insignis.
Cocos plumosa.
Cocos procapeana.
Cocos nucifera.
Cocos Weddelliana.
Chamædorea elegans.
Chamærops excelsa.
Chamærops gracilis.
Chamærops humilis.
Cycas Nordlanyana.
Cycas circinalis.
Cycas revoluta.
Dictyosperma aureum.
Dion edule.
Geonoma gracilis.
Kentia Australis.
Kentia Belmoreana.
Kentia Canterburyana.
Kentia Fosteriana.
Kentia Macathurii.
Livistonia Australis.
Livistonia altissima.
Livistonia Chinensis.
Macrozamia Madagascariensis.
Macrozamia plumosa.
Oreodoxa regia.
Phœnix dactylifera.
Phœnix reclinata.
Phœnix rupicola.
Phœnix Canariensis.
Pritchardia Guadichaurdi.
Pritchardia Martii.
Pritchardia Pacifica.
Rhopalostylis Baueri.
Rhapis flabelliformis.
Rhapis humilis.
Sabal Adansonii.
Sabal Blackburniana.
Seaforthia elegans.
Seaforthia robusta.
Thrinax elegans.
Zamia integrifolia.
Zamia Lehmanii.
Zamia villosa.

FERNS AND LYCOPODS.

Adiantum amabile.
Adiantum assimile cristatum.
Adiantum capillus veneris.
Adiantum cuneatum.
Adiantum cuneatum variegata.
Adiantum concinum latum.
Adiantum bellum.
Adiantum cardiochlæna.
Adiantum decorum.
Adiantum Farleyense.
Adiantum formosum.
Adiantum gracillimum.
Adiantum Hendersonii.
Adiantum Luddemanii.
Adiantum macrophyllum.
Adiantum monochlamis.
Adiantum pedatum.
Adiantum imarginatum.
Adiantum multifidum.
Adiantum pentophyllum.
Adiantum Peruvianum.
Adiantum Santa Catherinæ.
Adiantum trapeziformæ.
Adiantum Williamsii.
Adiantum Bausei.
Aspidium amabile.
Aspidium trifoliatum.
Asplenium alatum.
Asplenium Belangerii.
Asplenium bulbiferum.
Asplenium falcatum.
Asplenium viviparum.
Asplenium nidus.
Blechnum Braziliense.
Blechnum corcovadense.
Davallia Canariensis.
Davallia affinis.
Davallia bullata.
Davallia Japonica.
Davallia Mooreana.
Davallia tenuifolia.
Davallia tenuifolia stricta.
Davallia Fijinsis.
Davallia Fijinsis plumosus.
Doryopteris palmata.
Gymnogramma chrysophylla.
Gymnogramma decomposita.
Gymnogramma tartarea.
Gymnogramma triangularis.
Hymenodium crinitum.
Hymenophyllum demissum.
Lastrea aristata.
Lastrea aristata variegata.
Lomaria Gibba.
Lomaria heterophylla.
Lygodium scandens.
Marattia Douglassii.
Microlepia hirta cristata.
Microlepia Emersonii.
Nephrodium truncatum.
Nephrolepis davallioides cristata.
Nephrolepis davallioides furcans.
Nephrolepis Duffii.
Nephrolepis ensifolia.
Nephrolopis exaltata.
Nephrolopis exaltata plumosa.
Nephrolodium hispidium.
Netera depressa.
Polypodium pectinatum.
Polypodium plumosum.
Polypodium vulgaris.
Peilea andromedifolia.
Platycerium alcicorne.
Platycerium grande.
Pteris argyræa.
Pteris grandiceps.
Pteris hastata.
Pteris internata.
Pteris serrulata.
Pteris serrulata cristata.
Pteris serrulata variegata.
Pteris tricolor.
Pteris tremula.
Pteris cretica albo lineata.
Pteris limbata tasselata.
Pteris longifolia.
Pteris Victoria.
Scolopendrum cristata.
Selaginella aurea.
Selaginella cæsia arborea.
Selaginella cuspidata.
Selaginella denticulata.
Selaginella grandis.
Selaginella involvens.
Selaginella Mertensii.
Selaginella Wallichii.
Selaginella decarpa.
Selaginella Wildenovii.
Todea Africana.
Todea hymenophylloides.
Todea superba.

TREE FERNS.

Alsophila Australis.
Cibotium regalis.
Cibotium glaucum.
Cibotium chamissoi.
Cybotium Menziesii.
Cibotium princeps.
Cyathea dealbata.
Cyathea Smithii.
Dicksonia antarctica.
Dicksonia squarrosa.
Hemitetia Smithii.

NYMPHEAS AND WATER LILIES IN CONSERVATORY.

Linnocharis Humboldtii.
Nymphæ odorata.
Nymphæ alba.
Nymphæ rosea.
Nymphæ Devoniensis.
Nymphæ rubra.
Nymphæ dentata.
Nymphæ cœrulea.
Nymphæ alba candidissima.
Nymphæ pygmœa.
Nymphæ tuberosa.
Nymphæ marliacea chromadetta.
Nymphæ Zanzibarensis.
Nelumbium speciosum.
Pontederia crassipes.
Pontederia major.
Victoria regia.
Victoria Randii.

LIST OF BIRDS IN AVIARY.

Australian love-birds.
Arizona mountain quail.
Bluebirds.
Blue sparrows.
Bullfinches.
Blackbirds.
Black-hooded nuns.
Bleeding-heart pigeons.
Black-headed sparrows.
Bronze-wing pigeons.
Brown sparrows.
Canaries.
Cardinals.
Chinese orioles.
Chaffinches.
Chinese mocking-birds.
Chinese larks.
Chinese ducks.
Doves.
English jays.
East India mino.
Goldfinches.
Grosbeaks.
German wachtel.
Irish skylark.
Irish thrushes.
Indigo finch.
Indian skylarks.
Indian finches.
Japanese nightingales.
Japanese mocking-birds.
Japanese goldfinches.
Japanese gray sparrows.
Japanese white sparrows.
Kansas quail.
Linnets.
Lazula finches.
Mountain quail.
Meadow-larks.
Nashville warblers.
Nonpareils.
Oriole finches.
Orioles.
Owl finches.
Pekin nightingales.
Redheads.
Ring-doves.
Robins.
Sociables.
Siskin finches.
Strawberry-birds
Snow-birds.
Thrush.
Towhee bunting.
Topknot pigeons.
Tomtit.
Wood-larks.
Wanga-wanga pigeons.

BIRDS IN SMALL AVIARY AND ON GROUNDS.

Black and blue crows.
Black curasson.
Crested parrots.
Emus.
Guinea fowl.
Golden pheasants.
Japanese pheasants.
Horned owls.
Laughing jackass.
Mexican pheasants.
Pea fowl.
Rose cockatoos.
Bronze pheasants.
Silver pheasants.
White cockatoos.

LIST OF ANIMALS.

Bear.
Buffalo.
Black-tail deer.
Elk.
Kangaroo.
Moose.
Mountain sheep.
Mule deer.
Spotted deer.
White-tail deer.

IN SQUIRREL HOUSE.

35 Grays.
3 Browns.
1 Black.
4 Chipmunks.

POLICE REPORT.

The report of S. M. Thomson, Captain of the Park Police, shows the total number of arrests to have been 107 during the past fiscal year.

Amount received from fines for the above arrests is $545.

TWENTY-FIFTH ANNUAL REPORT

OF THE

BOARD OF PARK COMMISSIONERS

OF

SAN FRANCISCO,

FOR THE YEAR ENDING JUNE 30, 1896.

SACRAMENTO:
A. J. JOHNSTON, : : : : : : SUPERINTENDENT STATE PRINTING.
1896.

Office of the Commissioners of Golden Gate Park,
Buena Vista Park, Mountain Lake Park,
San Francisco, Cal., July, 1896.

To His Excellency James H. Budd, *and to the Legislature of the State of California*:

Gentlemen: The Park Commissioners herewith present a report of their management of the grounds under their charge for the year ending June 30, 1896.

JOSEPH AUSTIN,
IRVING M. SCOTT,
JOHN ROSENFELD,
Park Commissioners.

REPORT OF THE SECRETARY.

PARK OFFICE, July 1, 1896.

To the Honorable the Board of Park Commissioners:

GENTLEMEN: I have the honor to submit herewith my report for the fiscal year ending June 30, 1896.

V. V. BLOCH,
Secretary.

RECEIPTS AND DISBURSEMENTS FROM JULY 1, 1895, TO JULY 1, 1896.

RECEIPTS.

From taxes	$300,339 35
From rent of Children's Quarters	1,000 00
From rent of Boat-House	500 00
From fines	360 00
From sale of old junk	3 00
From sale of old horse	15 00
From rent of P. & O. R. R. depot	100 00
Balance from last year	407 90
	$302,725 25

DISBURSEMENTS.

Construction account	$193,100 55
Maintenance account	103,346 25
Salaries—Superintendent and Secretary	5,700 00
Balance	578 45
	$302,725 25

CONSTRUCTION ACCOUNT.

Construction of structures	$74,342 11
Construction of waterworks	8,570 04
Construction of drainage	463 90
Construction of roads and walks	27,472 23
Construction of grounds	42,123 91
Construction of forestry and reclamation	36,185 91
Conservatory	190 00
Museum	2,638 45
Small works	1,114 00
Total	$193,100 55

MAINTENANCE ACCOUNT.

Maintenance of structures	$5,256 50
Maintenance of waterworks	6,427 35
Maintenance of drainage	229 20
Maintenance of roads and walks	16,378 59
Maintenance of grounds	30,087 53
Maintenance of forestry	1,031 50
Maintenance of conservatory	5,527 64
Maintenance of police	18,995 28
Maintenance of museum	4,998 37
Aviary, deer, elk, buffalo, etc.	3,021 49

MISCELLANEOUS ACCOUNT.

Stock—Horses, birds, and rolling stock	$4,048 50
Miscellaneous—A number of current expenses not chargeable under either of the foregoing heads, printing demands, office expenditure, telephone, stationery, music, furniture, general expense, freight and express, advertising, lithographs and photographs for reports, Children's Day, etc.	7,344 30
Total	$103,346 25

APPORTIONED ACCOUNT.

Nursery—The entire nursery expenses, including labor, material, and new stock	$4,303 68
Stables—Including labor, hay and grain, harness, drugs, veterinary services rendered, etc.	11,205 55

WATERPIPE LAID DURING YEAR 1895–96.

	Feet.
½-inch	20
¾-inch	$70\frac{6}{12}$
1-inch	$60\frac{6}{12}$
1¼-inch	$1,047\frac{3}{12}$
1½-inch	$2,222\frac{2}{12}$
2-inch	$3,875\frac{2}{12}$
3-inch	$112\frac{1}{12}$
4-inch	$134\frac{6}{12}$
6-inch	$5,242\frac{9}{12}$
8-inch	$3,860\frac{4}{12}$
Total	$16,645\frac{3}{12}$

LIST OF DONATIONS RECEIVED DURING YEAR 1895–96.

Mrs. Joseph Austin—1 package of Sequoia gigantea seed.
D. & W. J. Stewart—1 deer.
H. R. Noack—1 owl.
J. Burtt Davy—Seeds of Cypress and Eucalyptus drepanphylla, Eucalyptus rostrata, and Eucalyptus Gunnii.
Miss E. Rodda—1 crane.
Mrs. R. E. Queen—1 orchid.
M. Hecht—2 deer.
Thomas Williams—2 rossignols.
Mrs. E. Kane—1 cockatoo.
Mrs. C. Nevills—1 cassowary.
A. P. Redington—Collection of tree seeds.
Mrs. Joseph Roylance—50 canaries.
Mrs. Sturge—1 squirrel.
James Nealon—Collection of wild flower seeds from Yellowstone Park.
Dr. R. Bowie—Collection of Nelumbium seeds.
E. A. Leigh—Seeds of honey locust from Washington's tomb, Mount Vernon.
Mrs. L. Fisher—Collection of seeds from Africa.
C. W. Coburn—1 package Atriplex semibaccatum seed.
J. D. McGilvray—Collection of Colorado blue spruce trees.
Miss E. Ackerman—1 ring dove.
Edward Doneborg—1 owl.
M. Manson—1 package juniper seed.
A. Morris—Collection of birds.
Mrs. Ramey—1 minor.
Dr. L. Yates—Collection of seeds.
F. Bennett—Root of Nelumbium speciosum.
William Greenfield—3 Alaskan geese.
I. C. Coggin—Package of sugar maple seed.
California Fruit-Growers' Association—Box of assorted seed from Guatemala.
H. W. Skinner—1 white squirrel.
S. H. Friedlander—1 pair Mongolian pheasants.

Fish Commissioners—20 yearling green sunfish, 8 large-mouth black bass (yearlings), 4 yearling yellow perch, and 12 yearling sunfish.

T. Lee—Collection of plants.

Hon. William Alvord—Package of seed and 52 copies of the Gardener's Chronicle.

Schwerin Brothers—7 plants Adiantum and two plants Alpinia nutans.

R. T. Van Noulen—1 package Tussac grass seed from Samoa.

A. Lindholm, Steamship Alameda—1 tamarind tree.

Allan J. Roy—1 deer.

Mr. S. Simmons—1 package seed of Balsam apple.

DONATIONS OF PLANTS FROM THE PARK DURING YEAR 1895–96.

TO CLEVELAND SCHOOL.

Cistus, in variety	6
Diosma alba	1
Diosma purpurea	1
Erica Mediterranea	1
Fuchsias	6
Geraniums, in variety	24
Heliotrope	2
Marguerites	6
Polygala Dalmaisiana	2
Roses	1
Solanum capsicastrum	1
Total	51

TO CITY AND COUNTY HOSPITAL.

Abutilon striatum	2
Alonsoa	60
Broom, yellow	12
Broom, white	12
Buxus sempervirens	2
Cistus ladaniferus	1
Cobæa scandens	3
Diosma alba	2
Euonymus, in variety	2
Erica Mediterranea	2
Escallonia rubra	2
Edwardsia microphylla	1
Geraniums, in variety	50
Helianthus minor	100
Ilex aquifolium	1
Indigofera Australis	1
Junipers, mixed varieties	3
Lilac	2
Ligustrum Japonicum	2
Lonicera, in variety	12
Œnothera Californica	6
Pittosporum crassifolium	4
Pittosporum nigrum	2
Pines, in variety	6
Polygala Dalmaisiana	2
Pansies	50
Poppies	216
Scabioas	60
Tritoma uvaria	2
Thymus, silver	50
Tagetes, double	60
Tagetes, perennial	60
Tacsonia	6
Veronica, mixed varieties	4
Wallflowers	12
Yucca Whipplei	2
Total	814

TO UNIVERSITY OF CALIFORNIA.

Achania malvaviscus	3
Agates robusta	2
Azalea seedlings	12
Buddleya globosa	2
Ceanothus Africanus	4
Cistus ladaniferus	4
Cistus, large white	4
Cistus rosea	3
Cistus, small white	4
Cytisus, 6 varieties	12
Diosma ericifolia	2
Diplopappus chrysophyllus	2
Edwardsia microphylla	2
Escallonia rosea	3
Eugenia myrtifolia	2
Gnaphalium lunatum	4
Hyoporum maculata	2
Indigofera Australis	2
Lantana, 2 varieties	4
Leptospermum ericifolia	3
Polygala Dalmaisiana	3
Raphiolepis ovata	2
Salvia Africanus	3
Salvia pinifolia	2
Solanum robusta	6
Swainsonia galegifolia	5
Teucrium heterophyllum	3
Veronicas, 6 varieties	12
Total	110

TO MARINE HOSPITAL.

Acacia, in variety	6
Dracæna Australis	2
Genista alba	50
Genista tinctoria	50
Leptospermum ericifolia	6
Œnothera Californica	50
Pritchardia filifera	4
Sequoia gigantea	1
Thuja gigantea	6
Veronica, in variety	6
Total	181

TO SAN QUENTIN.

Abutilons	6
Acacia, in variety	50
Achania malvaviscus	2
Agapanthus	2
Agrostemma	2
Alonsoa	12
Berberis vulgaris	4
Buxus sempervirens	2
Calycanthus occidentalis	6
Campanula	4
Canna indica	2
Cassia corymbosa	4
Casuarina suberosa	2
Ceanothus Africanus	4
Cistus	6
Coccoloba	2
Coprosma Baueriana	2
Cotoneaster	6
Cupressus macrocarpa seedlings	50
Datura Mexicana	2
Dianthus barbatus	12
Diosma, in variety	3
Diplopappus	2
Dracæna stricta	25
Edwardsia microphylla	2
Entelea arborea	2
Erica Mediterranea	2
Escallonia rubra	2
Fuchsias, in variety	12
Genista, in variety	25
Geraniums	50
Habrothamnus elegans	6
Hydrangea hortensis	4
Hypericum calycinum	2
Indigofera Australis	1
Juniperus communis	2
Laurus lusitanicus	2
Leptospermum, in variety	12
Leptosyne	12
Marguerites	24
Melaleuca ericifolia	6
Myoporum lactum	2
Œnothera Lambertiana	6
Olives	2
Pansies	50
Pentstemons	6
Pines, mixed	12
Pittosporums	18
Poppies	50
Pritchardia filifera	2
Raphiolepis ovata	2
Running vines	50
Salix aurea	12
Schinus molle	2
Solanums	4
Stocks	12
Thuja gigantea	6
Thyme	50
Tritonia seedlings	25
Ulex Europea	4
Veronica	12
Veronica, herbaceous	12
Viburnum tinus	2
Wallflowers	6
Yucca Whipplei	2
Total	727

TO HAIGHT STREET ORPHAN ASYLUM.

Acacia mollissima	12
Acacia melanoxylon	12
Acacia fragrans	12
Aucuba Japonica	2
Agave	1
Ceanothus Africanus	1
Clematis	1
Clianthus	1
Deutzia crenata	2
Diosma	2
Diplopappus	1
Dracæna seedlings	4
Entelea	1
Erica	2
Euonymus, var.	2
Hydrangea	2
Ilex aquifolia	2
Indigofera	1
Musa ensete	1
Mesembryanthemum cordifolium cuttings	50
Pansies	24
Pentstemons	6
Pinus insignis	2
Pittosporum crassifolium	2
Polygala	2
Pritchardia	2
Romneya	1
Schinus molle	2
Tritonia	1
Veronica Andersonii	1
Veronica Andersonii cuttings, small white	50
Yucca	2
Wallflower seed.	
Total	207

TO LICK SCHOOL.

Abutilons	4
Buxus sempervirens	2
Ceanothus Africana	4
Cupressus macrocarpa	20
Erica Mediterranea	2
Escallonia rubra	1
Euonymus Japonicus	6
Genista, mixed	25
Ilex aquifolia	1
Indigofera Australis	1
Juniperus	2
Leptospermum ericifolia	6
Pinus, mixed	12
Pittosporum, mixed	18
Polygala Dalmaisiana	1
Pritchardia filifera	4
Schinus molle	2
Thuja gigantea	6
Tritonia seedlings	12
Veronicas, mixed	12
Yucca Whipplei	2
Total	146

TO S. F. FIRE DEPARTMENT (Stanyan and Waller Streets).

Aloysia citriodora	1
Cistus ladaniferus	2
Carnations	2
Chrysanthemum, in variety	16
Dracæna Australis	2
Diosma alba	2
Dianthus barbatus	6
Erica Mediterranea	2
Fuchsia, in variety	6
Genista, in variety	6
Geraniums	12
Heliotrope	1
Helianthus minor	6
Leptospermum ericifolia	2
Marguerites	6
Pritchardia pacifica	2
Polygala Dalmaisiana	2
Veronica decussata	1
Vines, in variety	6
Total	82

TO CITY AND COUNTY ALMSHOUSE.

Berberis vulgaris	1
Chrysanthemum, in variety	100
Habrothamnus elegans	6
Total	107

TO QUARTERMASTER'S DEPARTMENT, PRESIDIO.

Pinus insignis	600

TO PUBLIC SCHOOL DEPARTMENT.

Abutilon, yellow	2
Brahea filamentosa	2
Buddleya globosa	2
Chamærops excelsa	2
Chamærops Nepalensis	1
Cupressus macrocarpa	2
Cobea scandens	2
Clematis Japonica	5
Clianthus puniceus	6
Cryptomeria Japonica	2
Cistus, in variety	12
Dahlias, in variety	12
Dolichos Lablab	12
Diosma, in variety	6
Erica Mediterranea	6
Euonymus Japonicus	1
Fuchsias, in variety	6
Geraniums, in variety	50
Heliotrope	6
Hydrangea	8
Indigofera Australis	6
Jasminum frutescens	2
Lobelia speciosa	250
Loniceras, in variety	25
Lophosperum scandens	2
Marguerites, in variety	25
Melaleuca decussata	2
Myoporum maculatum	1
Œnothera Lamarckiana	12
Olea sativa	2
Phœnix Canariensis	2
Pansies, in variety	50
Passiflora, in variety	8
Polygala Dalmaisiana	6
Roses	1
Schinus molle	1
Solanum, in variety	6
Salvia, in variety	12
Thymus, in variety	100
Wallflowers	25
Total	683

TREES, SHRUBS, PLANTS, VINES, ETC.

FLOWERING PLANTS PLANTED DURING YEAR 1895–96.

Asters, variety	377	Mathiola hybrida	1,910
Anemone, Whirlwind	3	Marguerites, yellow	1,440
Cosmos alba	400	Marguerites, white	720
Cosmos rosea	420	Œnothera Lamarckiana	80
Cosmos aurea	6	Pansies, mixed	11,870
Cosmos, variety	960	Pentstemons, mixed	406
Canna, Queen Charlotte	6	Phlox Drummondi	60
Dahlia hybrida	51	Petunia alba	2,860
Dahlia cactus, variety	631	Poppies, Shirley	1,080
Digitalis lutea	165	Rudbeckia grandiflora	1,840
Dianthus barbatus	240	Salpiglossis, variety	160
Fuchsias, variety	20	Salvias, variety	50
Geranium, Mad. Sallaic	10	Salvia splendens	20
Geranium, Ivy	300	Salvia amabilis	60
Geranium, Scarlet King	1,560	Salvia Africana	27
Geranium, Queen of Bronze	415	Salvia coccinea	46
Geranium, Snowball	1	Verbenas, variety	32
Gaillardia Lorenziana	125		
Helianthus minor	460	Total	31,511
Lobelia speciosa	2,700		

VINES PLANTED DURING YEAR 1895–96.

Ampelopsis Veitchii	5	Periploca glauca	1
Ampelopsis Royalii	6	Plumbago capensis	92
Clianthus puniceus	150	Plumbago Larapentæ	5
Cobæa scandens	202	Tacsonia rosea	293
Clematis Japonica	1	Tacsonia ignea	2
Clematis flamula	25	Tacsonia grenadillo	2
Clematis Jackmanii	12	Tacsonia Buchanani	2
Dolichos Lablab	250	Tacsonia floribunda	2
Eccremocarpus scaber	1	Tacsonia rubra	2
Linaria cymbalaria variegata	12	Tacsonia collisbra	1
Lonicera grandiflora	1,173	Tecoma radicans	12
Lonicera Japonica aurea	670	Tecoma jasminoides	14
Lonicera tatarica splendens	420	Wistaria cœrulea	3
Lonicera Californica coral	12	Wistaria alba	3
Lophosporum scandens	27	Wistaria brachybotrys	3
Passiflora cœrulea	306		
Passiflora alba	50	Total	3,760
Passiflora gloria munda	1		

TREES AND SHRUBS PLANTED DURING YEAR 1895–96.

Abies Douglasii	225	Acacia pycnantha	2
Abies Menziesii	11	Acacia aulocarpa	2
Abies nigra	36	Acacia decurrens	2
Abies alba	24	Acacia longifolia	4
Abies magnifica	3	Acacia armata	16
Abies cœrulea	6	Acacia mollissima	52
Abies amabilis	11	Acacia melanoxylon	200
Abies concolor	2	Acacia coccinea	5
Abies bracteata	24	Acacia cultriformis	21
Abies, mixed variety	12	Achania malvaviscus	66
Abutilon, in variety	140	Aloysia citriodora	4
Abutilon, Souvenir de Bon	2	Araucaria excelsa	1
Abutilon vexillaria	25	Andromeda Japonica	5
Abutilon rubra	6	Arbutus unedo	10
Acacia lophantha	911	Arbutus Menziesii	19
Acacia verticillata	318	Aucuba Japonica	140
Acacia latifolia	2,940	Artemesia glauca	5
Acacia fragrans	785	Azara macrophylla	6
Acacia calamistrata	7	Æsculus Japonicus	10
Acacia discolor	1	Acer macrophylla	24

Trees and Shrubs Planted During Year 1895-96—Continued.

Brugmansia suaveolens	2
Berchemia racemosa	4
Bambusa falcata	87
Betula populifolia	6
Buxus sempervirens	147
Benthamia frugifera	25
Bupleurum fruticosum	43
Buddleya Lindleyana	1
Buddleya globosa	38
Cistus ladaniferus	578
Cistus rosea	96
Cistus salvifolia	50
Cistus mina alba	50
Cistus major	120
Cistus, mixed variety	116
Clianthus puniceus	172
Commelina cœlestis	6
Cytisus hirsutis	630
Cytisus Laburnum	20
Cytisus spinosa	110
Cytisus elongatus	90
Cytisus elaborata	650
Cytisus Canariensis	390
Cupressus macrocarpa	2,000
Cupressus Lawsoniana	453
Cupressus Goveniana	15
Cupressus pyramidalis	3
Cupressus sempervirens	50
Ceanothus Africana	203
Ceanothus Californica	30
Ceanothus sessilifolia	337
Ceanothus integerrimus	350
Ceanothus prostrata	50
Cryptomeria Japonica	30
Cryptomeria elegans	3
Chimonanthus fragrans	4
Cercis sinensis	4
Clastrus arbuntatus	2
Clastrus cupressiformis	17
Cinnamomum pedunculatum	2
Cinnamomum sericeum	10
Camellia Sasanqua	5
Circidophyllus Japonicus	5
Cornus pubescens	50
Casuarina quadrivalvus	131
Citrus trifoliata	12
Citrus aurantiaca	3
Cedrus Atlantica	26
Cedrus Deodara	40
Cotoneaster buxifolia	115
Cassia floribunda	50
Castanea Americana	12
Callistemon rugulosus	15
Callistemon suaveolens	60
Colutea ferox	60
Coprosma Baueriana	235
Corynocarpus lævigatus	6
Dracæna Australis	16
Deutzia gracilis	160
Deutzia crenata	87
Deutzia Fortunei	50
Deutzia canescens	33
Diosma ericifolia	43
Diosma odorata alba	110
Diosma purpurea	78
Darlingtonia Californica	65
Diplopappus chrysophyllus	131
Daphne variegata	20
Erica Mediterranea	121
Erica arborea	175
Erica aurea	76
Euonymus Japonicus	345
Euonymus radicans	25
Euonymus aurea	25
Euonymus, variety	405
Eucalyptus, variety	1,545
Eucalyptus robusta	25
Eukimothus Japonicus	5
Elacoca cordata	4
Europeus elatus	1
Escallonia rubra	365
Escallonia rosea	54
Escallonia leucantha	11
Escallonia Phillipensis	12
Eugenia myrtifolia	11
Eugenia latifolia	7
Eleagnus Japonicus	6
Edwardsia microphylla	80
Eurybia Australis	19
Eupatorium Dishii	36
Frenella robusta	2
Fremontia Californica	9
Genista, variety	140
Genista tinctoria	1,067
Genista alba	2,432
Genista candicans	280
Genista linifolia	80
Gardenia sinensis	11
Hypericum Moserianum	30
Hypericum calycinum	30
Hypericum patulum	12
Hydrangea paniculata	2
Hydrangia hortensis	6
Habrothamnus elegans	7
Heliotropium Peruvianum	55
Ilex aquifolia aurea	1
Ilex aquifolia argentea	2
Ilex cornuta	4
Ilex robusta	5
Ilex latifolia	2
Ilex aquifolia	12
Illicium religiosum	1
Indigofera Australis	47
Jasminum fruticosum	12
Juniperus Virginiana	73
Juniperus argentea	6
Juniperus prostrata	21
Juniperus compacta	58
Juniperus Hibernica	37
Juglans nigra	12
Kaubra polygana	1
Kadsura Japonica	10
Leptospermum lævigatum	2,526
Leptospermum ericifolia	656
Lantana, variety	175
Ligustrum Ibota	5
Ligustrum Japonicum	206
Ligustrum Californicum	8
Laurus lusitanica	30
Myrica rubra	10
Mechelia compressa	4
Magnolia grandiflora	95
Melaleuca decussata	260
Maytenus Chilensis	70
Myrtus latifolia	58
Myrtus mucronata	55
Myoporum maculata	40
Olea sativa	142
Otera thyrax hispidum	4
Pinus maritima	300
Pinus Halepensis	34
Pinus ponderosa	53
Pinus Jeffreyi	32
Pinus monticola	9
Pinus austriaca	9
Pinus Sabiniana	10

TREES AND SHRUBS PLANTED DURING YEAR 1895-96—Continued.

Pinus Murrayana	6
Pinus Bermudiana	11
Pinus Torreyana	17
Pinus rubra	7
Pinus Lambertiana	33
Pinus Parryana	7
Pinus Coulterii	8
Pinus pinea	6
Pinus excelsa	6
Pinus sylvestris	13
Pinus strobus	25
Pinus insignis	580
Pinus mitis	24
Pinus tuberculata	24
Pinus, variety	72
Polygala Dalmaisiana	167
Phormium tenax	1
Picea pinsapo	32
Picea pectinata taxifolia	21
Picea pectinata	2
Picea bracteata	12
Picea sub-alpine	2
Picea, variety	12
Prunus Californicum	360
Pittosporum nigrum	41
Pittosporum eugenioides	207
Potentilla variabilis	10
Phillyrea angustifolia	1
Pimelia rosea	62
Quercus densiflora	115
Quercus robur serrata	10
Quercus sessiliflora	4
Quercus dentata	4
Quercus serrata	4
Ribes grossularia capens	2
Ribes sanguinea	6
Rhamnus Purshianus	6
Raphiolepis ovata	25
Swainsonia galegifolia	1
Schinus molle	260
Syringa vulgaris	20
Spiræa prunifolia	5
Spiræa aruncus	12
Spiræa obassia	2
Sequoia gigantea	18
Sambucus racemosa	6
Salix Babylonica	2
Salix aurea	100
Stauntonia hexaphylla	10
Serissa Japonica	4
Sterculia platanoides	5
Styrax obassia	4
Styrax Japonica	4
Stuartia pseudo-camellia	5
Stuckepecus peacox	2
Solanum jasminoides	1
Solanum capsicastrum	10
Thuja gigantea	710
Thujopsis dolabrata	22
Ulex Europea	140
Veronica, variety	48
Veronica cornea	22
Veronica decussata	66
Veronica cœrulea, dwarf	187
Veronica Andersonii	57
Veronica Andersonii variegata	27
Veronica arborea	34
Veronica elliptica	56
Viburnum tinus	100
Viburnum tinus lucidum	80
Yucca Whipplei	210
Yucca maculata	9
Yucca variegata	46
Yucca, variety	26
Zanthoxylum piperitum	1
Zeikoma Kecki	4
Total	31,567

LIST OF VINES IN PARK NURSERY.

Ampelopsis Veitchii	220
Ampelopsis Royalii	85
Aristolochia elegans	8
Bignonia velutina	1
Bignonia Tweediana	12
Bignonia Australis	6
Bignonia Thunbergiana	2
Cuphea tricolor	65
Cobæa macrostema	1
Cobæa scandens	175
Clematis paniculata	50
Dolichos Lablab	350
Eccremocarpus scabra	12
Ficus repens	25
Hedera helix aurantiaca	25
Ipomea cœrulea	6
Kennedya rubicunda	1
Kennedya Marryata	6
Lonicera Californica	16
Lonicera caprifolium	800
Lonicera Japonica	320
Lonicera grandiflora	480
Lonicera chamæcerasus	65
Lophospermum scandens	60
Maurandya Barclayana	1
Maurandya rubra	2
Manettia cordifolia	8
Mandevillea suaveolens	18
Passiflora cœrulea	120
Passiflora princeps	80
Passiflora Australis	130
Plumbago capensis	86
Perioploca glauca	4
Rubus fruticosus	25
Sollya heterophylla	8
Tacsonia Van Volxemii	5
Tasconia manicata	2
Tasconia rosea	560
Tecoma jasminoides	12
Tecoma radicans	3
Vitis Californica	85
Wistaria sinensis	4
Wistaria frutiscense	6
Wistaria brachybotrys	9
Wistaria alba	9
Wistaria albo fl. pl.	9
Total	3,977

FLOWERING PLANTS IN NURSERY.

Alternanthera amabilis	1,750
Alternanthera aurea-nana	21,300
Alternanthera versicolor	3,120
Alternanthera paronychioides	27,500
Alternanthera aurea major	7,105
Alternanthera aurea	6,435
Achyranthes Lindenii	350
Achyranthes bicolor	400
Achyranthes Collinsii	120
Achyranthes Verchaffeltii	100
Ageratum cœrulea, dwarf	75
Alyssum saxatile variegatum	1,500
Alyssum saxatile	12
Agrostemma coccinea	50
Agrostemma rosea	75
Antirrhinum var.	150
Adonis æstivalis	12
Aquilegia, new hybrid	80
Alonsoa alba	250
Alonsoa rubra	250
Centaurea gymnocarpa	50
Centaurea Americana	150
Campanula calycanthema	150
Carnation var.	175
Cosmos rosea	450
Cosmos rubra	400
Datura, double golden	12
Dianthus barbatus	2,000
Dahlias, in variety	1,000
Delphinum cordiopetalum	50
Digitalis leutea	100
Fuchsias, in variety	250
Gnaphalium lunatum	80
Geraniums, in variety	2,000
Helianthus minor	350
Helianthus major var.	12
Heuchera sanguinea	75
Heliotropium Peruvianum	120
Hollyhocks	15
Hollyhocks, in variety	150
Lobelia cardinalis	56
Lobelia speciosa	10,000
Lobelia splendens	6
Lobelia Cavanillesiana	12
Lantalum alba	8
Layia elegans	6
Leptosyne maritima	10
Mesembryanthemum cordifolium	500
Mathiola hybrida	600
Marguerite alba	300
Marguerite aurea	6
Macravillea alba	6
Nasturtiums, in variety	60
Nicotiana affinis	100
Œnothera Lamarckiana	500
Polyanthus	150
Pentstemon spectabilis	4
Pelargoniums, in variety	75
Petunias, in variety	250
Pansies	12
Papaver, Shirley	150
Papaver, Persian	2,000
Papaver, Iceland	1,300
Rudbeckia grandiflora	1,500
Rudbeckia alba	350
Solanum capsicastrum	140
Statice alba	350
Salvia patens	14
Salvia, Clara Bedman	7
Salvia splendens	450
Salvia globosa	100
Salvia pinifolia	25
Salvia, Africana	80
Tagates, hybrid	300
Tagates, perennial	450
Thymus elegantissimum	1,100
Thymus aurea	1,200
Viola cornuta	25
Wigandia Caucasana	150
Total	100,575

SEEDLING TREES AND SHRUBS IN PARK NURSERY.

Acacia latifolia	8,000
Acacia melanoxylon	400
Acacia mollissima	50
Acacia Riceana	25
Acacia verticulata	300
Acacia verticulata pendula	50
Acacia armata	100
Acacia fragrans	500
Acacia floribunda	500
Acacia lophantha	2,000
Abies Veitchii	1,000
Abies brachiphylla	400
Abies Menziesii	1,500
Abies macrocarpa	150
Ailanthus glandulosa	100
Cassia corymbosa	100
Cassia floribunda	100
Cupressus macrocarpa	1,800
Cupressus Lawsoniana	1,200
Cytisus elaborata	500
Cytisus Laburnum	50
Cytisus sessilifolia	50
Cytisus capitatus	300
Cytisus triflorus	300
Cytisus hirsutus	100
Entelea arborescens	100
Grevillea robusta	1,000
Genista linifolia	100
Genista alba	500
Genista tinctoria	500
Genista Australis	200
Ilex aquifolia	50
Leptospermum lævigatum	3,000
Leptospermum ericifolia	1,200
Pinus tuberculata	2,000
Pinus Coulterii	150
Pinus contorta	500
Pinus muricata	1,000
Pinus maritima	2,000
Pinus insignis	500
Picea polita	400
Picea grandis	400
Picea concolor	100
Spartium junceum	500
Sequoia sempervirens	200
Total	33,975

PALMS AND GRASSES IN PARK NURSERY.

Brahea filamentosa	6	Pritchardia filifera	6
Cocos Australis	6	Pritchardia Martii	1
Cocos nucifera	6	Phœnix Canariensis	2
Chamærops excelsa	11	Phœnix, small	500
Chamærops humilis	2		
Erythea armata	4	Total	595
Kentia Australis	1		
Pritchardia pacifica	50	New Zealand grass	500

TREES AND SHRUBS IN THE PARK NURSERY.

Abies Douglasii	1,800	Æsculus glabra	3
Abies Menziesii	523	Æsculus rubicunda	42
Abies Mertensiana	783	Æsculus Japonica	3
Abies nigra	60	Aloysia citriodora	300
Abies alba	10	Ailanthus glandulosa	3
Abies grandis	300	Arctostaphylos pungens	1
Abies firma	2	Arctostaphylos tomentosa	3
Abies amabilis	1,980	Arctostaphylos uva-ursi	15
Abies concolor	520	Amygdalus alba	2
Abies nobilis	930	Agave variegata	16
Abies magnifica	600	Anemone, Whirlwind	3
Abies Williamsonii	12	Andromeda Japonica	1
Abutilon Thomsonii	200	Araucaria Bidwellii	5
Abutilon Thomsonii variegata	120	Araucaria imbricata	700
Abutilon vexillaria	30	Araucaria excelsa	15
Abutilon alba	50	Arbutus unedo	12
Abutilon, Souvenir de Bon	10	Arbutus Menziesii	7
Abutilon rubra	150	Artemesia glauca	7
Abutilon frutiscense	120	Aucuba Japonica	370
Abelia rupestris	500	Azara macrophylla	2
Acacia armata	20	Bambusa falcata	20
Acacia decurrens	2	Berberis capitatus	9
Acacia dealbata	2	Berberis integerrinum	6
Acacia fragrans	420	Berberis vulgaris	370
Acacia floribunda	1	Berberis Darwinii	72
Acacia latifolia	140	Berberis stenophylla	6
Acacia lophantha	2	Berberis Thunbergii	8
Acacia linearis	4	Betula alba	28
Acacia melanoxylon	60	Boldoa fragrans	2
Acacia mollissima	150	Brugmansia suaveolens	60
Acacia pycnantha	1	Buddleya Lindleyana	2
Acacia Farnesiana	1	Buddleya globosa	150
Acacia verticillata	210	Buxus sempervirens	800
Acacia salicina	1	Buxus argentea variegata	500
Acacia citriodora	1	Buxus rotundifolium	350
Acacia longifolia	8	Buxus salicifolia	400
Acacia coccinea	12	Berchemia racemosa	2
Acacia aulocarpa	2	Calycanthus floridus	2
Acacia discolor	18	Calycanthus Humboldtii	2
Acacia cultriformis	2	Calycanthus occidentalis	650
Acacia calamistrata	4	Calystachys lanceolata	6
Acacia myrtifolia	1	Cassia corymbosa	18
Acacia stenophylla	1	Casuarina glauca	150
Acacia retinoides	3	Casuarina equisetæfolia	155
Acacia Trovissima	6	Casuarina quadrivalvis	1,200
Acacia capensis	15	Ceanothus Africana	3,500
Acacia horrida	2	Ceanothus Californica	300
Acacia pyramidalis	1	Ceanothus integerrimus	87
Acer glaucum	17	Ceanothus sessilifolia	80
Acer platanoides	10	Ceanothus prostrata	60
Acer dasycarpum	6	Ceanothe ceols	2
Acer macrophyllum	95	Cedrus Libani	10
Acer pseudo-platanoides purpurea	7	Cedrus Deodara	21
Achania malvaviscus	90	Cedrus Atlantica	37
Azalea occidentalis	300	Celtis cordata	129
Audibertia grandiflora	20	Cerasus laurus	74
Æsculus Californica	38	Ceratonia siliqua	1
Æsculus gigantea	1	Cercis siliquastrum	5
Æsculus pavia	1	Cercis sinensis	2

Trees and Shrubs in the Park Nursery—Continued.

Cestrum aurantiacum	12
Choisya ternata	35
Cistus ladaniferus	1,500
Cistus rosea	220
Cistus salviafolius	320
Cistus albidus	150
Citrus Chinensis	650
Citrus aurantiacus	12
Clerodendron speciosum	3
Clianthus puniceus	450
Cocoloba platyclada	125
Coprosma Baueriana	40
Colutea ferox	90
Cornus pubescens	750
Coronilla glauca	72
Corynocarpus lævigatus	52
Cotoneaster buxifolia	250
Cratægus oxycantha	90
Cratægus oxycantha pendula	7
Cratægus, scarlet thorn	2
Cratægus, Paul's double thorn	2
Castanea vesca	2
Castanea Americana	2
Castanea Japonica	15
Clastrus arbulatus	2
Chionanthus fragrans	2
Camellia Sasanqua	1
Cinnamomum sericum	1
Cinnamomum pedunculatum	2
Commelina cœlestis	2
Cestelia nervosa	3
Canna, Queen Charlotte	4
Colquhounia vistata	6
Circidophyllus Japonicus	1
Callindrica Californica	10
Callicoma serratifolia	2
Cryptomeria elegans	14
Cryptomeria Japonica	10
Cupressus macrocarpa variegata	24
Cupressus macrocarpa	2,000
Cupressus Goveniana	520
Cupressus sempervirens	100
Cupressus Knightiana	20
Cupressus MacNabiana	300
Cupressus Lawsoniana	1,400
Cupressus pendula glauca	20
Cupressus torulosa	150
Cytisus proliferus palmensis	3
Cptisus nigricans	4
Cytisus triflorus	28
Cytisus purpureus	6
Cytisus Laburnum	180
Cytisus bullatus	84
Cytisus capitatus	6
Cytisus, dwarf	12
Cytisus quercifolius	27
Cytisus sessiliflorus	4
Daphne odorata	6
Datura arborea	25
Deutzia crenata	11
Deutzia gracilis	175
Deutzia Fortunei	45
Diplopappus chrysophyllus	85
Deeringea celosoides	350
Deeringea celosoides variegata	240
Diosma ericifolia	85
Diosma alba	650
Diosma purpurea	320
Dracæna Australis	2,100
Dracæna nutans	7
Duranta Plumieri	12
Darwinia citriodora	4
Dryandra	4
Diplacus puniceus	7
Desmodium penduliflorum	5
Edwardsia microphylla	150
Eleagnus angustifolia	185
Eleagnus Japonicus	25
Erica arborea	6
Erica Mediterranea	1,000
Erica hymalis	120
Escallonia rubra	150
Escallonia rosea	85
Escallonia leucantha	22
Erythrina Caffra	5
Eucalyptus pilularis	1
Eucalyptus maculata	2
Eucalyptus rostrata	125
Eucalyptus Gunnii	220
Eugenia latifolia	42
Eugenia apiculata	1
Euonymus Japonicus	200
Euonymus aurea	120
Euonymus radicans	120
Euonymus argentea	450
Elecsria excelsa	20
Eupatorium Dishii	22
Eupatorium pinnata	60
Eucaphis haypbylloides	2
Eukimothus Japonicus	1
Elacoca cordata	2
Entelia arborea	25
Europeus elatus	1
Elæocarpus Hookeranus Bokaki	22
Fabiana imbricata	80
Fagus sylvatica	6
Ficus indica	2
Ficus carica	3
Ficus carica alba	2
Fraxinus platycarpa	9
Frenela robusta	2
Ginko biloba	3
Gardenia sinensis fl. pl.	1
Garrya Fremontia	1
Genista tinctoria	200
Genista alba	200
Geitonoplesium cymosum	2
Goodia latifolia	15
Grevillea robusta	2
Guevina avellana	2
Gentiana cacula	2
Gentiana acaulis	2
Harpullea pendula	1
Hamamelis Japonica	1
Habrothamnus elegans	450
Habrothamnus coccinea	25
Hakea acicularis	4
Hakea latifolia	1
Hardenbergia monophylla	1
Heimia grandiflora	130
Helianthemum roseum	1
Hibiscus pungens	6
Hibiscus Reevesii	7
Hibiscus splendens	3
Hydrangea paniculata	500
Hymenosporum flavum	2
Hypericum calycinum	850
Hypericum Moserianum	80
Indigofera Australis	80
Isochroma tubulosa	125
Isochroma coccinea	160
Ilex latifolia	1
Ilex cuneata	2
Ilex robusta	1
Ilex aquifolia	150
Illicium religiosum	1

TREES AND SHRUBS IN THE PARK NURSERY—Continued.

Jacaranda mimosifolia	4
Jasminum alba	2
Jasminum fruticosum	250
Jasminum capensis	12
Juglans nigra	70
Juglans Californica	13
Juglans Sieboldii	4
Justicia carnea	6
Juniperus pedunculata	12
Juniperus Chilensis	60
Juniperus drupacea	40
Juniperus communis	96
Juniperus communis suecica	120
Juniperus Bermudiana	10
Juniperus Japonica	60
Juniperus Japonica variegata	380
Juniperus prostrata	420
Juniperus squamosa	120
Juniperus compacta	420
Juniperus Hibernica	35
Juniperus Virginiana	260
Kerria Japonica	120
Kolreuteria paniculata	13
Kalmia glauca	50
Kaubra polyganum	1
Kadsura Japonica	2
Lantana var.	260
Larix Europea	70
Larix leptolepis	2
Larix leptolepis A	4
Larix leptolepis B	2
Larix leptolepis C	4
Lagerstrœmia indica	2
Laurus camphora	72
Laurus grandulosa	27
Laurus indica	12
Laurus lusitanica	1,000
Lavatera arborea	2
Lavatera arborea variegata	6
Lavendula spica	2
Leonotis leonaria	125
Leptospermum ericifolium	2,000
Leptospermum lævigatum	2,100
Libocedrus decurrens	750
Leucadendron argenteum	2
Liriodendron tulipifera	9
Ligustrum Japonicum	2
Ligustrum Japonicum variegatum	12
Ligustrum Ibota	1
Lycium parviflorum	12
Leycesteria elegans	127
Lagunaria Pattersonii	16
Laphlandria Jasbrightia	8
Lasiandra macrantha	25
Maclura aurantiaca	30
Maytenus Chilensis	150
Melianthus major	25
Mespilus Japonica	6
Metrosideros tomentosa	4
Morus alba	2
Murraya exotica	10
Myoporum maculatum	82
Myoporum latum	4
Myrica rubra	2
Myrica Californica	27
Melia Azaderach	72
Myrtus latifolia	30
Myrtus mucronata	36
Musa ensete	400
Mechelea compressa	2
Melaleuca decussata	340
Nandina domestica	9
Nerium splendens	2
Nierembergia gracilis	2
Nolene Beldenoi	120
Nymphæa odorata	24
Nymphæa odorata rosea	24
Nymphæa flava	24
Olea sativa	600
Oheles, Cranberry	5
Otera thyrax hispidum	2
Paulownia imperialis	2
Philadelphus coronarius	80
Phillyrea latifolia	15
Phillyrea ilicifolia	6
Phillyrea angustifolia	25
Pseudotsuga texifolia	240
Pavonia nastalis	3
Pavonia hastata	2
Pronaya Fabara	2
Potentilla variabilis	6
Phormium tenax	50
Photinia arbutifolia	17
Podaluria argentea	5
Persoonia salicifolius	1
Persoonia lanceolata	2
Picea pungens	350
Picea firma	18
Picea Smithiana	14
Picea Engelmanni	1,247
Picea bracteata	56
Picea grandis	98
Picea nobilis	177
Picea Sitchensis	2,727
Picea Alcockiana	12
Picea magnifica	53
Picea Nordmanniana	12
Picea pinsapo	80
Picea sub-alpina	8
Pimelia rosea	200
Pinus tuberculata	685
Pinus albicaulis	3
Pinus Coulteri	245
Pinus excelsa	24
Pinus Halepensis	200
Pinus Jeffreyi	11
Pinus insignis	5,000
Pinus longifolia	2
Pinus maritima	2,500
Pinus mitis	1,000
Pinus monticola	22
Pinus muricata	1,125
Pinus pinea	28
Pinus ponderosa	1,500
Pinus Sabiniana	590
Pinus Torreyana	204
Pinus Lambertiana	1,130
Pinus Austriaca	73
Pinus contorta	45
Pinus Canariensis	8
Pinus Fremontiana	3
Pittosporum eugenioides	4,200
Pittosporum crassifolium	600
Pittosporum nigrum	2,700
Pittosporum Buchanani	4
Pittosporum tobira	75
Pittosporum tobira variegata	125
Pittosporum undulatum	220
Platanus racemosus	5
Poinciana Gilliesii	3
Pyrus malus	12
Pomegranates	3
Polygala alternata	12
Polygala grandiflora	25
Polygala Dalmaisiana	220
Psoralea glandulosa	1

Trees and Shrubs in the Park Nursery—Continued.

Prostanthera Siebercii	80
Ptelea trifoliata	32
Phebalium dentalum	1
Prunus padus	1,000
Quercus robur	70
Quercus suberosa	11
Quercus densiflora	7
Quercus dentata	2
Quercus sempervirens	12
Quercus macrocarpa	8
Quercus palustris	7
Quercus tinctoria	50
Quercus dumasa bullata	25
Quercus stillengia	120
Quercus solapsis	80
Quercus palmyra	48
Quercus Humboldtii	3
Quercus alba	1,500
Quercus Douglasii	125
Quercus serrata	2
Quercus sessiliflora	2
Quercus ilex	1
Retinospora obtusa	28
Retinospora decussata	120
Retinospora plumosa aurea	160
Rhamnus Californica	400
Rhamnus alpinus	11
Rhamnus frangula	8
Rhamnus catharticus	11
Rhamnus Purshianus	26
Rhamnus infectorius	3
Romneya Coulteri	18
Rosa Wichuraiana	21
Rosa rubiginosa	90
Rhontheria paniculata	2
Robinia nigra	6
Raphiolepis ovata	350
Ribes sanguineum	25
Ribes alpinum	2
Rubus rosæfolius	2
Rubus fruticosus	2
Rhododendron alba	3
Rhododendron hybridum	27
Salisburia adiantifolia	3
Salix aurea	2,000
Salix purpurea	32
Salix Babylonica	27
Salix Kilmarnock	4
Sambucus racemosa	37
Sambucus, cut-leaved	86
Sambucus aurea	1
Sambucus nigra	6
Sequoia gigantea	100
Sequoia sempervirens	1
Schotia latifolia	1
Schinus molle	15
Schinus terebinthifolia	150
Solanum capsicastrum	12
Solanum robustum	6
Solanum macrocarpa	4
Solanum jasminoides	3
Solanum hæmitacarpum	2
Solanum crenulatum	2
Solanum laciniatum	25
Swainsonia alba	1
Swainsonia rubra	250
Styphelia pinnata	1
Syncarpia laurifolia	10
Stauntonia hexaphylla	2
Serissa Japonica	2
Styrax obassia	2
Streptosolen Jamesoni	38
Stipa pennata	5
Sterculia platanifolia	1
Spiræa aruncus	110
Spiræa obassia	1
Sedum, variety	300
Solandra grandiflora	8
Stuartia pseudo-camellia	5
Taxodium distichum	9
Taxus baccata	7
Taxus fastigiata	11
Taxus erecta stricta	7
Taxus aurea	4
Taxus brevifolia	540
Thuja gigantea	2,900
Thuja occidentalis	6
Thuja Pattoniana	8
Thujopsis dolabrata	700
Tilia Americana	2
Tilia Europea	7
Teucrium Canadense	180
Templetonia retusa	4
Thalictrum foliosum	6
Torreya Californica	20
Tritoma uvaria	3,400
Tsuga Mertensiana	600
Ulex Europeus	200
Upatorium Dishii	25
Upatorium pinnata	12
Viburnum lucidum	15
Viburnum opulus	10
Viburnum tinus	40
Viburnum tinus grandiflora	6
Vitex agnus-castus	3
Veronica, dwarf blue	2,750
Veronica arborea	900
Veronica carnea	400
Veronica decussata	500
Veronica elliptica	325
Veronica paniculata	16
Veronica salicifolia	250
Veronica Andersonii	380
Veronica Andersonii variegata	425
Venthereum annum	12
Weigela rosea	135
Widdringtonia cupressoides	6
Widdringtonia Whytei	1
Yucca Whipplei	900
Yucca bracteata	380
Yucca maculata	27
Yucca filamentosa	32
Zanthoxylon piperitum	1
Zeikoma Kecki	2
Total	104,688

GOLDEN GATE PARK MUSEUM.

ACCESSIONS DURING THE YEAR, FROM JULY 1, 1895, TO JUNE 30, 1896.

DONATIONS.

Adams, W. W., Union Springs, N. Y.
30 Indian stone implements.
Aver, J. H., San Francisco, Cal.
1 flying-fish.
Ætna Mine Co., Pope Valley, Napa County, Cal.
1 specimen cinnabar (quicksilver).
Atwood, E. N., San Francisco, Cal.
3 photographs of Klamath Indians, California.
Allardyce, Miss C., San Francisco, Cal.
1 canary-bird.
American Museum of Natural History, New York City.
1 copy of annual report, 1895.
Atkinson, T. E., San Francisco, Cal.
1 old book; 1 old newspaper; 1 rare U. S. Internal Revenue stamp.
Breon, Mrs. Paul, San Francisco, Cal.
9 specimens Zuni Indian pottery; 4 Navajo Indian bows; 13 Navajo Indian arrows.
Breon, Mr. Paul, San Francisco, Cal.
1 head of wild Rocky Mountain sheep (stuffed and mounted).
Brink, Mrs. H., San Francisco, Cal.
1 curious crossbill hen.
Burtis, S. R., San Francisco, Cal.
6 rare bird's-eggs; 1 specimen curious seaweed kelp.
Burbridge, Mrs. S. L., San Francisco, Cal.
2 canary-birds (stuffed and mounted).
Braverman, Mr. M., Visalia, Cal.
2 scientific books; 3 specimens cavern stalactites, Tulare County, Cal.; 14 specimens gem chrysoprase, Tulare County, Cal.; 1 specimen milky quartz, Tulare County, Cal.; 1 carved wooden vessel of Haida Indians of Queen Charlotte's Islands, B. C.
Blodgett, V. V., San Francisco, Cal.
1 specimen hercules beetle, South America.
Boston Museum of Fine Arts, Boston, Mass.
1 copy annual report, 1895.
Blaisdell, Henry, Lakeport, N. H.
2 Colonial relics.
Bement, C. S., Philadelphia, Pa.
5 specimens gem minerals.
Bardwell, John L., San Francisco, Cal.
23 Japanese bronzes; 9 carved wood grotesque masks, Japan; 7 carved wood panels, Japan; 6 carved wood plaques, Japan; 28 Japanese curiosities and carvings; 3 Japanese large vases; 5 specimens attractive minerals and gems; 15 old coins and medals; 15 Indian relics; 7 animal horns, walrus tusks, whale's teeth, etc.; 16 old papers, historical relics, etc.; 26 miscellaneous curiosities.
Cochrane, Capt. H. C., U. S. Marine Corps.
1 historical relic, Admiral Farragut's flagship.
Craig, Mrs. M. L., Redlands, Cal.
1 Indian bow; 10 Indian arrows; 1 pair Indian moccasins; 1 fan made of feathers of red-shafted flicker; 3 parcels of miscellaneous seashells and minerals; 1 horned toad, Southern California.
Clough, W. O., Visalia, Cal.
7 cavern stalactites, Tulare County, Cal.
Carmen, Mrs. W., San Francisco, Cal.
2 reptiles in alcohol; 1 bird's-nest; 1 skin of lizard; 1 specimen sea-anemone; 3 specimens nerides in alcohol.
California State Mining Bureau, San Francisco, Cal.
1 specimen colemanite; 1 copy annual report.
Cawston, Edwin, Norwalk, Cal.
15 ostrich feathers; 2 ostrich eggs; 2 photographs of California ostrich farm.

Chamberlain, Arthur, Newark, N. J.
23 specimens minerals, rocks, and ores.
Cheney, E. S., Oregon City, Oregon.
5 ornithological photographs.
Carr, Richard, Gilford, N. H.
1 parcel native flax.
Chapman Brothers, Philadelphia, Pa.
3 pieces coins and medals; 3 coin and medal publications.
California Midwinter International Exposition, San Francisco, Cal.
1298 articles, consisting of antique furniture, tapestries, rare china and porcelain, ivory carvings, miniature paintings on ivory and metal, antique pottery and glassware, rare objects of rock crystal and jade, marble and bronze statuary, musical instruments, antique wrought-iron work, armor, guns, pistols, swords, and other weapons, Greek frieze, etc.
379 silver and bronze coins and medals.
243 wood and plaster models of mineral crystals.
99 glass models of gem stones and crystals.
4 plaster relief maps.
5 plaster models of famous gold nuggets.
6 large models of cliff-dweller ruins.
1 model of whale (papier maché).
868 books for the Museum reference library.
Dickinson, Prof. T. A., Worcester, Mass.
2 Colonial relics.
Davis, J. Z., San Francisco, Cal.
17 pieces translucent onyx, polished; 288 specimens precious opal, various localities.
Foster, S. L., San Francisco, Cal.
37 specimens of birds (stuffed and mounted).
Fisher, George, San Francisco, Cal.
1 bronze medal.
Field Columbian Museum, Chicago, Ill.
Pub. I, Vol. I, No. 1; Pub. II, Vol. I, No. 2; Pub. III, Vol. I, No. 1; Pub. IV, Vol. I, No. 1; Pub. V, Vol. I, No. 1; Pub. VI, Vol. I, No. 1, 1895.
Fyfe, Claude, San Francisco, Cal.
1 photograph of humming-bird.
Folsom, J. G., Lakeport, N. H.
2 Colonial relics.
Garden, J., San Francisco, Cal.
2 Old Spanish silver coins.
Gordon, Miss Auguste E., San Francisco, Cal.
1 old newspaper.
Gall, William, San Francisco, Cal.
1 curious formation of granite.
Gumper, Joseph, San Francisco, Cal.
16 pieces historic papers, etc.
Gruber, Prof. F., San Francisco, Cal.
2 gray monkeys (stuffed).
Griffin, S. S., Auburn, N. H.
4 archæological specimens.
Gunther, C. F., Chicago, Ill.
Collection of photographs of war relics.
Golden Gate Park, San Francisco, Cal.
1 cassowary; 1 emu; 1 white swan; 1 black swan; 1 maccaw; 1 mallard duck; 1 gray squirrel; 21 small birds. Total, 28 specimens, received in the flesh, from the Aviary and animal quarters in the Park.
Hendy, Mrs. Francis A., San Francisco, Cal.
2 skins of ashy petrel; 1 skin of cassin's anklet, Farallone Islands, Cal.
Hackmeier, William, San Francisco, Cal.
2 garter snakes (stuffed); 1 young sea-otter.
Hafford, H. M., San Francisco, Cal.
1 jawbone of porpoise.
Higgins, Lewis, San Francisco, Cal.
1 young alligator, Florida.
Hubbard, Mrs. F. V., San Francisco, Cal.
1 ancient loom; 1 ancient shuttle; 1 bound book, for reference library.
Hunt, Miss Jane, Newport, Rhode Island.
2 specimens pink and green obsidian, Alaska; 2 art publications; 1 small parcel of mineral specimens.
Houston, Mrs. James T., San Francisco, Cal.
8 Indian arrow-points.
Herrick, H. S., Cripple Creek, Colorado.
3 specimens gold ore, showing much free gold.
Hagenkamp, L. K., San Francisco, Cal.
1 seashell decorated with painting of San Luis Obispo Mission, Cal.

Huguenin, J. G., San Francisco, Cal.
1 skin of flying-squirrel.
Hornung, Doctor, San Francisco, Cal.
1 skull of pouched gopher; 1 rattlesnake in alcohol.
Hubbs, C. L., Daggett, Cal.
1 specimen iron ore, 70 pounds, from San Bernardino County, Cal.
Irelan, W., San Francisco, Cal.
1 small Japanese spider crab.
Janke, W. A., San Francisco, Cal.
1 historical picture, early days of San Francisco.
Joseph, Nathan, San Francisco, Cal.
7 photographs of Warner's "cobweb palace" (historical).
Jenness, William, Lakeport, N. H.
2 Colonial relics.
Jewell, Hon. E. F., Laconia, N. H.
3 archæological photographs.
Kunz, George F., New York City.
1 copy "Folk-Lore" of precious stones.
Kinrade, J. J., San Francisco, Cal.
2 specimens American rubies.
Kauffman, Miss Sophie, San Francisco, Cal.
40 specimens seashells and minerals; 11 miscellaneous curiosities.
Klefeker, Mr. L., San Francisco, Cal.
1 double-headed chicken.
Lloyd, Reuben H., San Francisco, Cal.
1 golden eagle (stuffed and mounted); 1 fossil hip bone of a mastodon; 1 cranium and long tusks of a giant walrus, Behring Sea; 1 large crystal gem aquamarine (Beryl), Topsham, Maine.
Lawson, Y. C., San Francisco, Cal.
2 photographs, Walapia Indians; 2 ammonites, Giant's Causeway, Ireland.
Lissak, Ormond M., U. S. Navy, Benicia, Cal.
1 skin of a snake.
Lamb, Thomas F., Portland, Me.
19 specimens minerals, rocks, and ores of Maine.
La Dieu, J. H., San Francisco, Cal.
1 old newspaper.
Lattin, F. H., Albion, N. Y.
7 natural history specimens.
Lam, Leong, San Francisco, Cal.
1 specimen white branching coral, polished, mounted in enamel dish in glass case, Corea.
Libby, Mrs. R., Lakeport, N. H.
3 Colonial relics.
Laird, Mrs. E. A., Sawyer's Bar, Cal.
1 tarantula hawk.
Mish, Dr. S. C., San Francisco, Cal.
1 model of a catamaran (native canoe), South Sea Islands.
Miller, Hale, San Francisco, Cal.
1 historical newspaper.
Munro, Mrs. M. V., San Francisco, Cal.
1 four-legged chicken.
Metropolitan Museum of Art, New York City.
1 copy annual report, 1895.
Malowansky, John, San Francisco, Cal.
1 full-size (3-man) baidarka (native canoe), Alaska; 2 models skin-covered canoes, Alaska; 5 models dog-sleds, Alaska; 4 jars alcoholic specimens, consisting of marine invertebrates, fish, insects, etc., Alaska; 19 images and various figures and utensils carved in bone and ivory, Alaska.
Meyer, Mr. Henry, San Francisco, Cal.
12 stuffed birds.
Melsing, G. A., San Francisco, Cal.
30 historical papers, documents, etc.; 20 varieties U. S. internal revenue stamps.
MacKenzie, Master A., San Francisco, Cal.
3 bird's-nests, Santa Clara County, Cal.
McGrigor, Finlay, San Francisco, Cal.
1 tray made of fossiliferous limestone.
McColgan, C., San Francisco, Cal.
1 specimen hippocampus (sea-horse).
Nolan, Joseph, San Francisco, Cal.
1 Indian stone mortar.
Neff, Hon. J. H., Colfax, Cal.
1 head and horns of American reindeer (caribou), British Columbia.
Orcutt, C. R., Orcutt P. O., Cal.
1 specimen hippocampus (sea-horse).
Oxnard, Miss, Palace Hotel, San Francisco, Cal.
2 silver Algerian dress-pins.

Paulson, Mrs. Blanca, San Francisco, Cal.
1 specimen cancer-root, Central America.
Plank, Louis, San Francisco, Cal.
27 historical documents, papers, bills, etc.
Phelan, L., San Francisco, Cal.
1 Australian paroquette.
Pennsylvania Museum of Art, Philadelphia, Pa.
1 copy annual report, 1895.
Prill, Dr. A. G., Sodaville, Or.
124 specimens bird's-skins, comprising 48 species; 324 bird's-eggs; 10 bird's-nests.
Quarre, Emille, Larkspur, Cal.
7 specimens of birds in the flesh; 3 specimens young hare; 1 large specimen fungus.
Rhoads, Daniel, Lemoore, Cal.
2 Indian stone mortars.
Ross, Donald, San Francisco, Cal.
1 curious deer horn; 1 cock, with spurs 5 inches long.
Rochat, Arthur, Livermore, Cal.
13 historical photographs; book of autographs and crests; 9 miscellaneous articles.
Robbins, James J., San Francisco, Cal.
1 Confederate bond; 2 Confederate notes.
Stock, E. C., San Francisco, Cal.
1 Spanish silver coin; 1 souvenir of banquet of ex-President Harrison.
Smith, Mr. W., San Francisco, Cal.
1 specimen flexible coral.
Smith, Miss Carrie, San Francisco, Cal.
1 Indian stone mortar; 1 Indian skull; 1 string Indian shell money; 1 great blue heron, Santa Catalina Island, Cal.
Smith, G. W. V., Springfield, Mass.
1 antique Japanese bronze vase.
Simms, Dr. J., New York City.
10 specimens mammals, including types of new species, from Australia; 19 aboriginal skulls from Australia, New Zealand, and Tasmania; 27 miscellaneous objects and curiosities from New Zealand, Australia, and Japan.
Sanders, Mrs. S. A. D., Lakeport, N. H.
5 specimens of minerals and curiosities.
Selfridge, F. C., San Francisco, Cal.
40 specimens beetles, Central America; 10 specimens seashells; 13 specimens minerals and curiosities.
Saroni, Louis, San Francisco, Cal.
2 ship's passports signed by U. S. Presidents Jefferson and Monroe; 1 letter dated 1796, written by Robert Morris, one of the signers of the Declaration of Independence.
Smithsonian Institution, Washington, D. C.
Annual report, publications, recipes, photographs.
Schneider, Louis, San Francisco, Cal.
1 ancient copper coin.
Sutton, W. S., San Francisco, Cal.
2 curious bird's-nests, including one of weaver-bird, Africa.
Taylor, H. R., Alameda, Cal.
3 ornithological engravings; 3 bird's-eggs.
Taylor, Mrs. M. H., Great Barrington, Mass.
1 historical publication.
Thomson, Capt. S. M., San Francisco, Cal.
1 specimen gold quartz; 1 specimen petrified wood.
Thomson, Master Samuel, San Francisco, Cal.
1 group of quartz crystals.
U. S. National Museum, Washington, D. C.
1 copy annual report; various publications.
Van Horn, C. E., Gallup, New Mexico,
2 specimens peridots, in rough.
Vannah, Wilder, Laconia, N. H.
2 Colonial relics.
Vreeland, Mrs. E. B., San Francisco, Cal.
1 kitten with two heads (stuffed).
Voorhees, Mrs. W. H., San Francisco, Cal.
1 historical relic; 1 ancient cup plate (historical).
Wiel, Lewis F., San Francisco, Cal.
2 old Presidential impeachment tickets.
Wilson, W. C., Mojave, Cal.
6 specimens of minerals, Borax Lake, Cal.
Wilson, Frederick, Oakland, Cal.
3 specimens paper currency of Peru, Mexico, and Confederate States.
Williams, George W., Alameda, Cal.
1 ancient pistol; 1 old bronze medal; 1 box minerals, rocks, and ores.

Webb, W. F., Albion, New York.
7 bird's-eggs (two original sets).
West, M. H., San Francisco, Cal.
1 specimen white pronghorn coral.
Walsh, Mrs. David, San Francisco, Cal.
2 paws of black bear.
Wooster, W. D., Berkeley, Cal.
1 barn owl, in the flesh.
Young, Harry, San Francisco, Cal.
1 skin of Jacobine pigeon.
Yates, Dr. L. G., Santa Barbara, Cal.
12 lithographic prints of aboriginal smoking-pipes and money.

EXCHANGES.

Selangor Museum, Selangor, Straits Settlements.
78 specimens of birds; 12 animals; 1 skeleton; chiefly Asiatic specimens. Total, 91 specimens.

PURCHASES.

19 gold coins, United States and foreign.
273 silver coins, United States and foreign.
192 copper, nickel, and bronze coins, United States and foreign.
85 medals, United States and foreign.
Total—569 coins and medals.

POLICE REPORT.

The report of S. M. Thomson, Captain of the Park Police, shows the total number of arrests to have been 86 during the past fiscal year.

Amount received from fines for the above arrests is $360.

SECOND BIENNIAL REPORT

OF THE

DEBRIS COMMISSIONER

1895-1896.

JOHN F. KIDDER, of Grass Valley, - - Debris Commissioner.

SACRAMENTO:
A. J. JOHNSTON, : : : : SUPERINTENDENT STATE PRINTING.
1896.

REPORT.

To his Excellency James H. Budd, *Governor of the State of California:*

Sir: As Debris Commissioner of the State of California, I beg herewith to submit my biennial report.

I have attended most of the executive sessions of the California Debris Commission, appointed by the United States to grant permits and to regulate hydraulic mining in the territory drained by the Sacramento and San Joaquin rivers. The officers comprising the Board are Col. Chas. R. Sutter, Major C. E. L. B. Davis, and Capt. C. E. Gillette, who succeeded Col. Mendell, Col. Benyuard, and Major Huer, all being officers of the U. S. Engineer Corps; to each of whom I desire to return my thanks for the courtesies shown me as the representative of the State.

From the date of my appointment I received my salary under the opinion furnished Hon. E. P. Colgan, Controller of State, at his request, by Hon. W. H. H. Hart, Attorney-General. From November, 1895, to July, 1896, my salary was cut off by the opinion furnished the Controller, at his request, by Hon. W. F. Fitzgerald, Attorney-General. On the 9th of June, 1896, the Controller, again, at my request, asked the Attorney-General in reference to my salary, for the reason that the United States had appropriated the sum of $250,000 for the building of dams to restrain the debris already in the streams, thus making the $250,000 appropriated by the State available; and in answer the Attorney-General gave his opinion (a copy of which is annexed, marked "A") that from July 1, 1896, I was entitled to my salary.

On August 14th the Attorney-General gave the Controller an opinion in reference to the manner of expending the State appropriation, called forth by a letter of inquiry to me from Col. Sutter, Chairman of the California Debris Commission. (Copy of Attorney-General's opinion annexed, and marked "B.")

On March 7, 1895, I appointed Hon. R. I. Thomas, Secretary of the State Debris Commission, and his salary was suspended at the same time as mine.

On March 4, 1896, at the request of parties owning a hydraulic mine on Lytle Creek, San Bernardino County, I examined proposed location of dam-site for same, and made them the following report:

Col. A. B. Hotchkiss, *Los Angeles, California:*

Dear Sir: At your request I have, as State Debris Commissioner, examined the proposed location of a dam to restrain debris from hydraulic mines located on Lytle Creek, San Bernardino County, California.

The proposed location of said dam is at a point known as Miller's Narrows, Sec. 26, T. 2 N., R. 6 W., near the residence of J. N. Miller. The Narrows have steep rock banks on either side, being, at base line of dam, 300 feet apart, and on crest of proposed dam, at a height of 75 feet above base, 400 feet.

It is proposed to erect a stone dam with a slope on up-stream side of one and one half feet base to one foot perpendicular, and on down-stream side with a slope of one quarter of a foot base to one foot perpendicular, making the crest of said dam 20 feet wide, the base being at bedrock about 160 feet in width, and to pave the up-stream side of said dam with rock, making it impervious to water.

I can see no objection to this dam or form of building, provided the spillway cut in the solid rock be made of sufficient size to carry the full volume of the stream during a freshet; from observations taken at this point for a series of years, the volume of water in the greatest freshet known seems to be about 200,000 miner's inches. The spillway should be cut in the solid rock, and so located that the surface of water behind dam shall never be within 3 feet of the crest of dam.

I would recommend that the dam should at first be constructed only 40 feet in height, with same base and slope as heretofore mentioned, and a spillway as above described made at that height; and when this is sufficiently filled with debris, then the dam should be carried up to the finished height and the first spillway made secure by rock masonry laid in Portland cement. When this dam is completed and full, there are other points on Lytle Creek, short distances below this site, that might be utilized for erecting smaller dams.

From my standpoint I do not think the dam will be any menace to those parties owning land below the same, if it is constructed in the manner outlined above.

I would further recommend that the interstices between the rock composing the dam should be well and securely filled with gravel.

Very respectfully,

JOHN F. KIDDER,
State Debris Commissioner.

Grass Valley, Cal., March 7, 1896.

In my last report I recommended that, in view of the great interest involved, an effort should be made to have the State Debris Commissioner made a member of the U. S. Commission. An Act to that effect was reported favorably in the House of Representatives of the United

States, and allowed to slumber in said House. I still think it should be passed, and that our State Legislature request our Representatives, and instruct our Senators, to such effect.

I append a list of applications to the U. S. Commission to grant permits for hydraulic mining, and their action thereon.

Respectfully submitted.

JOHN F. KIDDER,
State Debris Commissioner.

(A)

SAN FRANCISCO, CAL., June 9, 1896.

HON. E. P. COLGAN, *State Controller, Sacramento, Cal.:*

DEAR SIR: In reply to your favor of the 5th inst., inclosing a letter of Hon. John F. Kidder, and to your request for another opinion from me relative to his salary as Debris Commissioner, in view of the fact stated in his letter that the United States Government has made an appropriation of $250,000 "for dams," I am of the opinion that, if the United States Government has appropriated $250,000 "to be used in the construction of works for the restraining or impounding of debris in California," the Debris Commissioner is authorized by the Act of March 24, 1893 (Stats. 1893, pp. 339, 340), "to enter upon the actual discharge of his duties," and that "during the time he shall be actually employed in the discharge of his official duties" he is entitled to "a compensation of three hundred dollars per month, * * * to be allowed by the State Board of Examiners."

Respectfully,

W. F. FITZGERALD,
Attorney-General.

(B)

ATTORNEY-GENERAL'S OFFICE, STATE OF CALIFORNIA,
SAN FRANCISCO, August 14, 1896.

HON. E. P. COLGAN, *State Controller, Sacramento, Cal.:*

DEAR SIR: I am in receipt of your favor of the 29th ultimo, inclosing a letter addressed to Hon. John F. Kidder, Debris Commissioner, by the United States Debris Commission, and referred to you by Mr. Kidder for your action, and in which you request my opinion "as to the following: Under the provisions of Sections 4 and 7 of the Act of March 24, 1893 (Stats. 1893, p. 339), can this appropriation of $250,000 be paid over to the Treasurer of the United States, as contemplated by the terms of the Congressional Act appropriating an equal amount?"

I am of the opinion that the payment of the California appropriation in question into the Treasury of the United States is not authorized by the Act of our Legislature, approved March 24, 1893, creating the office of Debris Commissioner, and providing for his appointment, duties, and compensation, etc. (Stats. 1893, pp. 339, 340), nor do I consider such payment necessarily "contemplated by the terms of the Congressional Act appropriating an equal amount," as a condition precedent to the expenditure of the Federal and State appropriations for the purposes specified. Section 4 of the California statutes provides that: "There is hereby appropriated out of the General Fund of the Treasury of this State not otherwise appropriated, the sum of two hundred and fifty thousand dollars, no warrant against said sum to be paid or drawn until the United

States Government shall have appropriated at least an equal amount, to be used in the construction of work for the restraining or impounding of mining debris in California. Said moneys to be paid only upon orders drawn by the Controller, upon the written request of the said Debris Commissioner, and to be drawn only for the payment of not more than one half the cost of the construction of any such works for restraining and impounding mining debris as shall have been approved by him and duly adopted and recommended by engineers of the United States Government appointed for that purpose."

This provision, in my opinion, contemplates the payment of the appropriation in question in such sums as may be necessary from time to time as the work progresses and is "approved" by the Debris Commissioner of this State, and not in a lump sum to the United States Government to be expended by the officers of that Government upon the future contemplated work.

Section 7 of the same Act provides that "All expenditures authorized by the provisions of this Act shall be subject to the approval of the State Board of Examiners." This bears out my construction of the intent of the Legislature as expressed in Section 4; for, had the Act contemplated that the Debris Commissioner should pay over to the authorities of the Federal Government the full amount of the California appropriation as soon as an equal amount was appropriated by the Government, it would have been unnecessary to provide for the auditing of the expenditures under the Act by the State Board of Examiners.

The item in the River and Harbor Bill, passed by Congress on the 3d day of June, 1896, which relates to the impounding of mining debris in this State, is as follows:

"For the construction of restraining barriers, for the protection of the Sacramento and Feather rivers in California, two hundred and fifty thousand dollars; such restraining barriers to be constructed under the direction of the Secretary of War, in accordance with the recommendation of the California Debris Commission, pursuant to the provisions of, for the purposes set forth in, section twenty-five of the Act of Congress of the United States, entitled 'An Act to create the California Debris Commission and regulate hydraulic mining in the State of California,' approved March first, eighteen hundred and ninety-three; *provided*, that the Treasurer of the United States be, and he is hereby, authorized to receive from the State of California, through the Debris Commission of said State, or other officer thereunto duly authorized, any and all sums of money that have been, or may hereafter be, appropriated by said State for the purposes herein set forth. And said sums, when so received, are hereby appropriated for the purposes above named, to be expended in manner above provided."

It will be noted that this provision does not make the payment, by the State Debris Commission "or other officer thereunto duly authorized," into the Treasury of the United States, of the moneys appropriated by the State for the purposes specified, a condition precedent to the expenditure of the $250,000 appropriated by Congress. That appropriation was made without any qualification, and can be expended for the purposes specified, whether any portion of the California appropriation is used for that purpose or not. The proviso to this item from the River and Harbor Bill merely authorizes the Treasurer of the United States to receive from the State of California any moneys that may have been or may be appropriated for the purposes set forth in the item, but does not necessarily require that such moneys shall be paid to the United States Treasurer.

I see nothing in the Federal appropriation which would inhibit the expenditure of the money appropriated by this State in the manner contemplated by the Legislature of the State, viz.: at such times, and in such payments as may be rendered necessary by the progress of the work and its approval by the California Debris Commissioner. Therefore, while I do not think that under the law it is the duty of the California Debris Commissioner to pay over the $250,000 appropriated by the Legislature of this State to the Federal California Debris Commission for the purpose of having the same paid into the Treasury of the United States, I am of the opinion that the California appropriation can be expended, as provided in Section 4 of the California Debris Commission Act, for one half of the cost of the contemplated mining debris work as that work progresses, and as the same is approved by the California Debris Commissioner and adopted and recommended by the engineers of the United States Government appointed for that purpose.

Respectfully,

W. F. FITZGERALD,
Attorney-General.

TABULATED LIST OF MINES SINCE REPORT OF 1893-94, FROM WHICH SHOWING ACTION TAKEN BY THE

Number	Name of Mine	County	Name of Applicant	Mine Drains into Tributary of	Nature of Tailings Reservoir Proposed for Present Use
77	Hidden Treasure.	Amador	Ben Hur Mining Co.	Mokelumne	Brush dams, log and rock dams, in Grass Valley Creek.
78	Martelle	El Dorado	Leonard Dormody.	American	Martelle Creek
79	Gold Run	Placer	Gold Run Ditch and Mining Co.	American	Two rock dams, North Fork American River.
80	Spanish John	Nevada	John Black	Yuba	Log and brush dams in blind ravines.
81	North Rim	Placer	G. H. Pease and J. B. Colwell.	American	Dams, Mexican Gulch.
82	Crown Point	Plumas	Crown Point Mining Co.	Feather	Log and brush dam, Porter Ravine.
83	Spring Valley	Butte	Mariano C. Costa	Feather	Rock dam, Sawmill Gulch.
84	Kentucky Flat	El Dorado	H. E. Picket	American	Log and brush dam, North Otter Creek.
85	Johnson	Amador	William Johnson	Sacramento	Brush dam in ravine.
86	Henrietta	El Dorado	El Dorado Water & Deep Gravel Mining Co.	American	Brush dam in ravine.
87	Leroy Hedge	Yuba	Leroy Hedge	Yuba	Brush, rock, and log dam below mine.
88	Epley	El Dorado	Louis Rolland and Alonzo Vanderberg.	American	Brush, gravel, and rock dam in ravine.
89	York Mining Co.	Yuba	York Mining Co.	Yuba	Brush and log dam below mine.
90	Last Chance	El Dorado	Edward Hancock and W. H. D. Aly.	American	Brush and gravel dams, Hancock Ravine.
91	Goodman & Bund.	Amador	Goodman & Bund.	Mokelumne	Timber and brush dam, Ashland branch of Sutter Creek.
92	Goodman Bros.	Amador	F. A. Goodman and W. H. Goodman.	Mokelumne	Timber and brush dam, Ashland branch of Sutter Creek.
93	'49 Flat	Amador	Geo. W. Hadley and — Boles.	Mokelumne	Log and brush dam, '49 Gulch.
94	Fine Gold	Calaveras	G. A. Meinecke, Chas. Sanguinette, and J. S. Shepherd.	Stanislaus	Rock and brush dam, Skunk Ravine.
95	American House.	Plumas	A. Blair	Feather	Dams, American House Ravine.
96	Central Hill Placer.	Calaveras	Wm. Thomas, Sr., M. McCormick, W. A. Bisbee, and W. Thomas, Jr.	Stanislaus	Rock and stone dam
97	Kate Gray	Amador	Giovanni Rossi	Mokelumne	Brush dam
98	Spring Tunnel and Spring Cañon.	El Dorado	Jay E. Russell	American	Brush dams, Spring Cañon.
99	Shealor	Amador	J. E. Newson	Mokelumne	Log, rock, and brush dam, Sutter Creek.
100	Railroad Hill Gravel.	Calaveras	Giani, R.T. Luigi, and Lugi Demartini.	Calaveras	Brush dam in Dry Gulch.

APPLICATIONS HAVE BEEN RECEIVED TO WORK UNDER THE LAW
CALIFORNIA DEBRIS COMMISSION.

Approximate Amount of Gravel Proposed to Mine—Cu. Yds.	Application Received	Order Issued to Build Impounding Works	License Granted	Mined and Stored Previous to June 1, 1895. Cu. Yds.	Storage Capacity yet Available, Partly or Wholly Completed. Cu. Yds.	
30,000	Nov. 3	Nov. 27, 1894	Mar. 30,'95	23,066	----------	
30,000	Nov. 3	Jan. 22, 1895	Feb. 18,'95	200	100	
11,655,000	Nov. 3	----------	----------	----------	----------	
121,000	Nov. 8	Nov. 27, 1894	Dec. 17,'94	11,325	3,675	
10,000	Nov. 20	Feb. 12, 1895	Feb. 26,'95	4,000	6,000	
45,000	Nov. 26	----------	Apr. 15,'85	2,850	8,650	
484,000	Dec. 3	Feb. 26, 1894	----------	----------	----------	
100,000	Dec. 5	Works already built.	Feb. 5,'95	12,758	84,742	
100,000	Dec. 10	Jan. 15, 1895	----------	----------	----------	
7,000	Dec. 11	Works already built.	Jan. 22,'95	750	----------	Mine worked out.
2,500	Dec. 14	Works already built.	Feb. 15,'95	308	2,000	
3,500	Dec. 18	Works already built.	Jan. 22,'95	200	----------	
4,000	Dec. 20	Works already built.	Feb. 5,'95	6,200	1,500	
50,000	Dec. 21	Works already built.	Jan. 22,'95	8,060	----------	
100,000	Dec. 24	Works already built.	Jan. 14,'95	5,000	19,680	Joint reservoirs.
50,000	Dec. 24	Works already built.	Jan. 14,'95	1,320		
250,000	Dec. 26	Works already built.	Jan. 14,'95	24,000	19,100	
4,000	Dec. 27	Feb. 26, 1895	Mar. 5,'95	12,500	4,000	
2,500	Jan. 17	----------	May 13,'95	207	----------	Suspended.
1,000,000	Jan. 17	----------	Mar. 25,'95	9,600	134,600	
10,000	Jan. 17	Feb. 26, 1895	Mar. 5,'95	600	12,950	
56,000	Jan. 17	Apr. 23, 1895	----------	----------	----------	
1,500	Jan. 29	Works already built.	Mar. 5,'95	250	1,250	
48,000	Feb. 1	Works already built.	Feb. 26,'95	8,300	15,900	

TABULATED LIST

Number	Name of Mine	County	Name of Applicant	Mine Drains into Tributary of	Nature of Tailings Reservoir Proposed for Present Use
101	James Slater	Yuba	James Slater	Yuba	York Mining Co.'s dam.
102	Grizzly Hill	Amador	Moy Gin Mun	Mokelumne	Log and brush dam, and old pit.
103	Deer Valley	El Dorado	Wulff Bros.	American	Brush dam in ravine.
104	Strawberry Placer.	Calaveras	John Enos	Stanislaus	Two rock dams in dry gulch.
105	Mount Gregor Gold.	El Dorado	Porter Phillips	American	Brush and gravel dam, Spanish Ravine.
106	Red Hill and Telegraph Hill.	Amador	Geo. R. Evans, John Erickson, M. Fitzgerald.	Mokelumne	Log crib dam, Chile Gulch.
107	Blacklock	El Dorado	Geo. W. Edwards	American	Brush and gravel dam, Spanish Ravine.
108	Kelly & Matherly.	Placer	M. A. Kelly and W. H. Matherly.	Sacramento	Worked-out pit, Rattlesnake Bar.
109	Dry Gulch	Amador	O. M. Henry		Brush dam, below mine.
110	Sawmill Flat	Shasta	J. K. Williams	Sacramento	Worked-out pits
111	Mooney Placer	El Dorado	Thos. Ewing	American	Log and brush dam, worked-out pit.
112	Grizzly Flat	El Dorado	Geo. Wheeler and Moses C. Wheeler.	Cosumnes	Log and brush dam, Grizzly Flat.
113	Gold Deposit	El Dorado	David Croft	American	Retaining wall, old hydraulic pit.
114	Railroad Placer.	El Dorado	Wm. Franklin Coe.	American	Brush dam on mine property.
115	Independence	Yuba	John A. Broyles	Yuba	Letson Ravine
116	J. C. Day	El Dorado	J. C. Day	American	Brush dam in ravine.
117	Iowa	Placer	Wm., Henry and John Henning.	American	Brush dam in ravine.
118	Tiger	Placer	Jas. Ward and Wm. McDonald.	American	Brush dam in ravine.
119	Hard Times	Placer	Jos. J. and A. A. Hoffman, and H. McDonald.	American	Brush barriers in old hydraulic pit.
120	El Dorado Placer.	El Dorado	Wm. and W. J. S. Bacchi.	American	Brush dam in small stream.
121	Zentgraf & Cross.	El Dorado	J. Zentgraf and J. J. Cross.		Worked-out pit
122	St. Lawrence	Nevada	Ah Wing	Yuba	Brush dam in Illinois Cañon.
123	Polar Star	Placer	John Spaulding	Bear	Liberty Hill dam, Bear River.
124	Liberty Hill	Nevada	T. G. Phelps	Bear	Liberty Hill dam, Bear River.
125	Lost Camp	Placer	J. B. Rathbone et al.	American	Log and brush dam, Woods Ravine.
126	McFadden	Calaveras	A. J. Mason	Mokelumne	Rock and brush dam, Buckeye Gulch.
127	Joubert	Sierra	Fred'k Joubert	Yuba	Old pits and dams, Willow Creek.
128	Sailor Boy	Sierra	Michael Cortez	Yuba	Brandy City Mine's dam.
129	Plumas Imperial.	Plumas	Plumas Imperial Gold M'g Co.	Feather	Rock dam in Rock Creek.

of Mines—Continued.

Approximate Amount of Gravel Proposed to Mine—Cu. Yds.	Application Received	Order Issued to Build Impounding Works	License Granted	Mined and Stored Previous to June 1, 1895. Cu. Yds.	Storage Capacity yet Available, Partly or Wholly Completed. Cu. Yds.	
30,000	Feb. 14	Works already built.	Feb. 26,'95	----------	----------	
300,000	Feb. 12	Mar. 19, 1895	Apr. 8,'95	100	5,000	
5,000	Feb. 13	Works already built.	Mar. 18,'95	----------	5,000	
3,000	Feb. 13	Works already built.	Mar. 18,'95	1,445	1,555	
200,000	Feb. 20	Works already built.	Apr. 22,'95	----------	----------	
15,000	Feb. 23	Works already built.	Mar. 18,'95	5,960	3,240	
403,000	Mar. 1	Works already built.	Apr. 1,'95	2,960	----------	
20,000	Mar. 5	----------	----------	----------	----------	Permit refused Apr. 8, 1895.
10,000	Mar. 7	Works already built.	Apr. 8,'95	500	1,000	
30,000	Mar. 8	May 13, 1895	----------	----------	----------	
968,000	Mar. 13	Works already built.	Apr. 1,'95	3,000	5,000	
10,000	Mar. 16	Works already built.	Apr. 1,'95	----------	5,000	
18,000	Mar. 22	Works already built.	Apr. 22,'95	1,100	17,095	
3,000	Mar. 23	Apr. 23, 1895	Sept. 30,'95	93	----------	
1,800	Mar. 27	----------	Mar. 17,'96	375	----------	
1,000	Mar. 27	Apr. 23, 1895	Mar. 30,'96	----------	----------	
1,150	Mar. 29	Apr. 23, 1895	May 13,'95	1,450	1,000	
7,000	Apr. 1	Apr. 23, 1895	May 13,'95	375	1,025	
30,000	Apr. 1	Works already built.	Apr. 22,'95	1,650	7,000	
4,000	Apr. 3	Works already built.	Apr. 22,'95	----------	4,000	
4,200	Apr. 9	Works already built.	Apr. 29,'95	----------	4,200	
150,000	Apr. 15	July 2, 1895	Oct. 28,'95	3,300	----------	
2,000,000	Apr. 17	----------	----------	----------	----------	Permit refused May 20, 1895.
144,000	Apr. 25	----------	----------	----------	----------	Permit refused May 20, 1895.
180,000	Apr. 29	Aug. 5, 1895	Dec. 16,'95	12,600	50,000	
240,000	May 27	June 17, 1895	----------	----------	----------	
420,000	June 3	June 17, 1895	July 15,'95	----------	255,000	
20,000	June 3	Works already built.	Aug. 5,'95	----------	----------	
120,000	June 11	----------	July 8,'95	22,500	371,520	

TABULATED LIST

Number	Name of Mine	County	Name of Applicant	Mine Drains into Tributary of	Nature of Tailings Reservoir Proposed for Present Use
130	Horse Valley	Yuba	M. V. Turner, Mrs. E. M. Brown, and Wm. Wellman.	Feather	Brush dam in Horse Valley Creek.
131	Young's Hill	Yuba	Wm. Wellman	Yuba	Brush dams in dry gulch.
132	Atom	Yuba	E. C. Cochran and Chas. Turner.		Brush dams in Williamson Creek.
133	Galena Hill	Yuba	W. R. and M. J. Williams.		Old hydraulic pit, Galena Hill.
134	Tippecanoe	Sierra	George Parent	Yuba	Brush dam in Spanish Ravine.
135	O'Keeffe	Sierra	D. O. O'Keeffe	Yuba	Closing waste cuts hydraulic pit.
136	Charcoal Ranch.	Sierra	Fourier and John Barrere.	Yuba	Flat adjacent to mine.
137	Sharp	Sierra	E. C. Kendall, J. C. Peterson, H. Kimball.	Yuba	Brush dam, Sharp Ravine, old pit and reservoir.
138	Homestake	Sierra	C. Wichman, W. Elkins, W. R. and B. F. Atkinson.	Feather	Dam, blind ravine
139	Corkscrew	Plumas	S. F. Toland and G. W. Langdon.	Feather	Brush dam back of Spanish Ravine.
140	Last Chance	Plumas	Henry Goering	Feather	Log crib dam, outlet of Flat Basin.
141	Chapelain Qrtz	Yuba	Jas. Chapelain	Feather	Brush dams in dry ravine emptying into Honcut Creek.
142	Roome	Sierra	Luigi Lagomacini.	Yuba	Brush dam across mouth of pit.
143	Big Ravine	Nevada	T. T. Kirkham	Yuba	Earth and gravel dam across old reservoir and brush dam on top of this and other dams.
144	Brown Placer	Sacramento	Interior Development Co.	Cosumnes	Brush and earth dam, Flat Ravine.
145	Cascade	Plumas	Cascade Water and Mining Co.	Feather	Log crib dam in Clear Creek.
146	Willow Placer	Sierra	N. B. Willits and B. Pride.	Yuba	Brush and timber dam across sloping swale.
147	Canada	Sierra	Oliver F. Caya and W. T. Sherman.	Yuba	Log crib dam, French Ravine.
148	King Sayre	Sierra	W. A. and M. E. Schofield.	Yuba	Brush and log dam, Whisky Creek.
149	Argentine	Sierra	Hy H. and A. A. Meyer and Jno. Costa.	Yuba	Brush dam in a basin
150	Eureka Hydraulic.	El Dorado	John Pascoe	American	Brush dams, Chili Ravine.
151	Terry Hill	Plumas	E. C. Hard	Feather	Old pit stopped with stone dams.
152	Gravel Hill	El Dorado	E. D. Simpson, Gerhard Tebble, and J. A. Hunt.	American	Log dams, Gravel Hill Cañon, and natural barrier Jones Hill Cañon.

OF MINES—Continued.

Approximate Amount of Gravel Proposed to Mine—Cu. Yds.	Application Received	Order Issued to Build Impounding Works	License Granted	Mined and Stored Previous to June 1, 1895. Cu. Yds.	Storage Capacity yet Available, Partly or Wholly Completed. Cu. Yds.	
12,000	June 11	July 16, 1895			12,000	
5,000	June 11	July 16, 1895			7,500	
70,000	June 11	July 16, 1895			25,000	
84,000	June 11	July 15, 1895	May 25,'95	2,975	81,025	
32,000	June 11	July 15, 1895	Oct. 28,'95	6,330	27,670	
6,000	June 23	July 15, 1895			3,000	
150,000	June 23	Works already built.	July 23,'95	314	15,000	
200,000	June 24	Aug. 5, 1895			200,000	
15,000	June 25	July 29, 1895	Sept. 28,'95		15,000	
25,000	June 28	Works already built.	Sept. 2,'95	3,937	5,000	
10,000	July 1	Works already built.	July 29,'95	300	10,000	
11,245,630	July 3	Oct. 14, 1895				
4,600	July 5	Works already built.	July 29,'95		1,800	
6,000	July 6	Aug. 5, 1895			6,000	
177,467	July 6	July 29, 1895				
774,400	July 10	Sept. 2, 1895	Dec. 2,'95		400,000	
11,000	July 20	Works already built.	Sept. 2,'95	462		
12,444	July 26	Sept. 23, 1895	Nov. 18,'95	12,500	10,788	
18,000	July 31	Works already built.	Nov. 18,'95	1,200	8,000	
4,000	Aug. 6	Sept. 23, 1895	Nov. 11,'95		4,500	
24,200	Aug. 7	Sept. 12, 1895	Sept. 30,'95	2,500		
7,480	Aug. 21	Works already built.	Oct. 14,'95	2,286	4,850	
387,000	Aug. 31				860,000	Applicants not to work mine this season.

Number	Name of Mine	County	Name of Applicant	Mine Drains into Tributary of	Nature of Tailings Reservoir Proposed for Present Use
153	Lone Star Placer.	Plumas	Will De Vinny	Feather	Gravel dam and log dams, Jackson Creek
154	Poorman's Hydraulic.	El Dorado	Charles Jordan	American	Two brush dams, Taylor's Ravine.
155	Eagle Mining Claim.	Amador	Lorenzo Canata and Giacomo Oneto.	Mokelumne	Brush dam, Dry Creek.
156	Jackson Creek Placer.	Plumas	Mrs. Bertha Sutton.	Feather	Old pits and dams, Jackson Creek.
157	Bobby Burns Hydraulic.	El Dorado	Hy Niedecker and Geo. Alderson.	American	Brush dam, Johnson's Creek.
158	Dutch	Plumas	Simcoe Chapman.	Yuba	Log crib dam in Rabbit Cr'k, and old pit.
159	Lewis	Plumas	Fred Lewis	Feather	Dams in old pit and Rich Gulch.
160	Martin Hydraulic.	El Dorado	C. W. and W. W. Martin.	American	Dam in White Rock Cañon.
161	Miocene	Plumas	Chas. Y. Hepler	American	Dams in Schneider Gulch, and old pit.
162	Arctic	Plumas	Fred Scott	Feather	Dam, Marian Creek
163	Tiedeman	El Dorado	Henry E. Picket	American	Brush dam in Marshal Cañon.
164	Chaparral Hill Gold Gravel	Plumas	Ed and James Bryan and August Fish.	Feather	Brush rock dam in dry ravine.
165	Blacklock	El Dorado	Eugene Piaggi	American	Dams in Taylor and another ravine.
166	Pacific	Sierra	Daniel Conlan	Yuba	Old pits; cuts stopped with dams.
167	Plumas Blue Gravel.	Plumas	Plumas Blue Gravel Mg. Co.	Feather	Old hydraulic pits
168	Reese	Shasta	George Reese	Sacramento	Brush dam in a dry ravine.
169	Ram Creek Placer.	Butte	J. M. McClung	Feather	
170	Con. Sailor Creek Placer.	El Dorado	Geo. W. Davey	American	Log, brush, and rock dam, Irish Creek.
171	Michigan Hill	Plumas	John Higgins	Feather	Two old pits stopped with brush dams and log dam on flat ground.
172	Manzanita	Nevada	Kate Hayes Mg. Co.	Yuba	Gravel and brush dams, Sweetland Ck.
173	Farrel	Nevada	Eureka Lake & Yuba Canal Co.	Yuba	Earth dam in worked-out pit.
174	Forest Home	Amador	W. A. Roberts and John Graham.	Cosumnes	Earth and stone dam, Arkansas Creek.
175	Bull Neck Gravel.	Amador	J. F. Ish	San Joaquin	Log and brush dams in blind ravine.
176	Cole	El Dorado	W. H. Cole	Cosumnes	Brush dams in worked-out pit.
177	Milk Gulch Gravel.	Amador	Hy M. and H. N., Jr., Dickerman and John Dynam.	Cosumnes	Brush dam in dry gulch.
178	Jay Bird	Yuba	John G. Ramm	Yuba	Rock dam
179	Wild Yankee	Placer	Wm. Schilliansky, C. A. Oakes, R. W. Walter, and S. L. McKim.		

OF MINES—Continued.

Approximate Amount of Gravel Proposed to Mine—Cu. Yds.	Application Received	Order Issued to Build Impounding Works	License Granted	Mined and Stored Previous to June 1, 1895. Cu. Yds.	Storage Capacity yet Available, Partly or Wholly Completed. Cu. Yds.	
18,488	Aug. 31	Works already built.	Oct. 14,'95	8,362	4,000	Permit suspended Feb. 26, 1896. Authorized to resume work Mar. 18, 1896.
3,023	Sept. 22	Oct. 15, 1895	Dec. 16,'95	540	4,000	
10,300	Sept. 22	Works already built.	Nov. 4,'95	----	----	
32,000	Sept. 28	Nov. 19, 1895	----	----	10,000	
40,333	Oct. 1	Works already built.	Nov. 18,'95	----	3,750	
12,000	Oct. 3	Works already built.	Nov. 18,'95	33,700	----	
1,000	Oct. 4	Works already built.	Nov. 18,'95	----	----	
38,720	Oct. 4	Nov. 19, 1895	Mar. 30,'96	3,000	----	
6,000	Oct. 8	Nov. 19, 1895	Dec. 30,'95	----	1,025	
18,000	Oct. 8	Nov. 19, 1895	----	----	----	
129,066	Oct. 11	Works already built.	Nov. 18,'95	----	----	
38,233	Oct. 18	Nov. 19, 1895	Dec. 16,'95	----	33,333	
413,000	Oct. 19	Works already built.	Nov. 18,'95	1,960	34,000	
4,629	Oct. 19	Works already built.	Nov. 18,'95	----	5,610	
44,444	Oct. 19	Nov. 19, 1895	Dec. 30,'95	----	----	
500,133	Oct. 21	Nov. 26, 1895	Jan. 6,'96	----	----	
----	Oct. 21	----	----	----	----	
14,520	Oct. 25	Works already built.	Nov. 18,'95	4	2,500	
15,000	Oct. 29	Nov. 19, 1895	Dec. 2,'95	2,120	----	
1,169,604	Sept. 23	Oct. 7, 1895	Oct. 28,'95	134,900	900,000	
111,000	Oct. 28	Works already built.	Nov. 18,'95	48,584	170,000	
1,420,000	Nov. 2	Works already built.	Dec. 23,'95	33,000	10,000	
200,000	Nov. 8	Dec. 24, 1895	----	----	50,000	
12,000	Nov. 16	Works already built.	Dec. 23,'95	240	13,000	
900	Nov. 19	Dec. 24, 1895	Mar. 30,'96	----	----	
12,100	Nov. 23	Dec. 24, 1895	Jan. 20,'96	2,450	1,800	
100,000	Nov. 25	Dec. 16, 1895	----	----	----	

TABULATED LIST

Number	Name of Mine	County	Name of Applicant	Mine Drains into Tributary of	Nature of Tailings Reservoir Proposed for Present Use
180	Badger Hill	Plumas	A. B. Jacks and John Gifford.	Feather	Dam in Woods Ravine and close cuts.
181	Pine Leaf	Plumas	John Schafer	Feather	Brush dam in worked-out pits.
182	Quaker Hill	Nevada	Geo. C. Sargeant	Yuba	Dams on flat ground, Deer Creek.
183	Meehan Placer	Amador	Jas. Meehan	Sacramento	
184	Trafton	Placer	J. N. Findley	American	
185	Irish Hill	Amador	G. W. Smith	Mokelumne	Brush dam in a dry gulch.
186	Kerr	Placer	Jos. G. DeBons	American	Brush barriers in Devil's Cañon.
187	Claybank	Plumas	Henry A. Hallstead.	Feather	Log and brush barriers in flat swale.
188	Sherwood & Snyder.	Tuolumne	L. M. Sherwood, W. H. Snyder, and O. E. E. Riley.	Tuolumne	Worked-out bed of Moccasin Creek.
189	Blue Gravel Placer.	Amador	W. H. Glenn, and J. H. Hayden.	Mokelumne	Brush dam, Rancheria Creek.
190	Emma Harding.	Plumas	J. F. Evans	Feather	No works necessary
191	Roman	Plumas	John Smith	Feather	No works necessary
192	Kendall	El Dorado	Wiley Sexton	Cosumnes	Dogtown Creek
193	Polar Star	Placer	John Spaulding	Feather	Bear River
194	Liberty Hill	Nevada	T. G. Phelps	Feather	Bear River
195	Adkins	Shasta	Olonzo Engle		Brush dams in a gulch.
196	Quong Yuck	Nevada	On Sackee and Ah You.	Yuba	Log dam, Humbug Creek.
197	Kanaka Flat	Plumas	Wm. Wampler and Solon P. Jacks.	Feather	Log dams in ravine and Spanish Creek.
198	Coney	Shasta	G. M. Coney and W. S. Adkins.	Sacramento	Brush dams
199	Gorman	Placer	H. L. Van Eman	American	Log and brush dams, Skunk Gulch.
200	Princess	Shasta	O. H. Simons	Sacramento	Crib dam in dry gulch
201	Goyan	El Dorado	Frank Goyan	American	Brush dam, Fish Cañon.
202	Nigger Ranch	El Dorado	Giacomo Giannini and J. L. Poggi.	Cosumnes	Log dam
203	Proper	Calaveras	John Sybel	Stanislaus	
204	No Chunk	Placer	E. S. Thompson and G. E. Hill.	American	Log dam in Skunk Gulch.
205	Kanaka Valley.	El Dorado	A. J. McDonald	American	Brush and rock dam
206	Empire Hill	Yuba	Paris Bean	Yuba	Board and log dam
207	Badger Hill	El Dorado	John J. Bailey	American	Pine-tree dam
208	Dark Ravine	Plumas	Mrs. Amalie Hafner.	Feather	Log and brush dams, Dark Ravine.
209	Grasshopper Hydraulic.	El Dorado	B. Guidici	Cosumnes	Two brush dams
210	Miner's Row	Placer	E. D. Hurd	American	Brush and log dams.
211	Nellie Bly	Shasta	Alfred A. Ludwig and Wm. Everest.	Sacramento	Log and brush dam
212	Duquesne Placer.	Plumas	R. R. Gumbert	Feather	Log and brush dam in dry ravine.
213	Try Again Hydraulic.	El Dorado	Giacomo Varozza	American	Brush dam

of Mines—Continued.

Approximate Amount of Gravel Proposed to Mine—Cu. Yds.	Application Received	Order Issued to Build Impounding Works	License Granted	Mined and Stored Previous to June 1, 1895. Cu. Yds.	Storage Capacity yet Available, Partly or Wholly Completed. Cu. Yds.
15,000	Nov. 27	Dec. 23, 1895	Jan. 13,'96	935	--------
4,000	Nov. 29	Works already built.	Dec. 23,'95	140	650
70,000	Nov. 30	Works already built.	Dec. 30,'95	--------	244,000
217,800	Dec. 3	Dec. 24, 1895	Mar. 30,'96	997	--------
4,000	Dec. 3	Dec. 16, 1895	Mar. 30,'96	82	4,000
322,667	Dec. 5	Works already built.	Dec. 23,'95	--------	73,333
2,000	Dec. 6	Jan. 13, 1896	Mar. 30,'96	--------	2,200
6,500	Dec. 14	Works already built.	Jan. 13,'96	2,500	3,500
75,000	Dec. 14	No works necessary.	Jan. 13,'96	--------	--------
10,000	Dec. 23	Works already built.	Jan. 13,'96	5,000	--------
2,500	Dec. 23	No works necessary.	Jan. 13,'96	--------	--------
--------	Dec. 23	No works necessary.	Jan. 13,'96	--------	--------
100	Dec. 26	Sept. 21, 1896	--------	--------	--------
2,000,000	Dec. 31	June 6, 1896	--------	--------	--------
144,000	Jan. 2	June 6, 1896	--------	--------	--------
161,334	Jan. 2	Works already built.	Jan. 20,'96	--------	--------
75,000	Jan. 4	--------	--------	--------	--------
6,000	Jan. 7	--------	Jan. 20,'96	722	--------
150,000	Jan. 10	--------	Mar. 17,'96	2,208	--------
160,000	Jan. 13	Mar. 18, 1896	Mar. 30,'96	--------	--------
4,114,000	Jan. 16	Mar. 18, 1896	Mar. 30,'96	--------	--------
3,484,800	Jan. 7	Jan. 20, 1896	--------	--------	--------
3,000	Jan. 22	Feb. 10, 1896	--------	--------	4,000
14,000	Jan. 22	Mar. 18, 1896	Mar. 30,'96	--------	--------
--------	Jan. 22	Mar. 18, 1896	Mar. 30,'96	--------	--------
900	Jan. 28	Sept. 21, 1896	--------	--------	--------
1,700	Feb. 3	--------	--------	--------	--------
32,266	Feb. 17	--------	--------	--------	6,666
1,000	Feb. 20	--------	--------	--------	600
20,000	Feb. 20	Apr. 20, 1896	--------	--------	--------
48,400	Feb. 24	Apr. 6, 1896	--------	--------	--------
6,453	Mar. 17	--------	Apr. 6,'96	140	1,200
3,000	Mar. 19	--------	--------	--------	1,100
4,500	Mar. 23	--------	July 20,'96	--------	6,666

Number	Name of Mine	County	Name of Applicant	Mine Drains into Tributary of	Nature of Tailings Reservoir Proposed for Present Use
214	Ellen Taylor	El Dorado	Cy Mulkey	Cosumnes	Log and brush dam
215	Phillips Claim	Placer	Wm. Phillips	American	Three brush dams
216	Cook Gravel	Tuolumne	F. W. Eaton	Tuolumne	None
217	Raffetto Placer.	El Dorado	Giovanni Raffetto.	American	Brush and timber dams.
218	Parke & Brown Claim.	Placer	Bernard Cavanaugh.	American	Two log dams in dry ravine.
219	Deer Creek	Nevada	Eber A. Sanford.	Yuba	None
220	Slate Creek Placer.	Plumas	Henry W. Orr	Feather	Two log and brush dams.
221	Buckeye Hill Placer.	El Dorado	John J. Flora	American	Dam in Buckeye Cañon and flat ground.
222	Calif'rnia Gold Mining and Investment Co.'s Claim.	Plumas	California Gold Mining and Investm'nt Co.	Feather	Brush dam, Foreman Cañon.
223	Shirley Mining Co.'s.	Placer	Shirley Mining Co.	American	Two brush dams
224	Malone Gravel	El Dorado	J. R. Vandergrift.	Cosumnes	None
225	Jack's Ranch Placer.	Plumas	Walter Shackleford.	Feather	Log and brush dam
226	Sacket's Gulch Claim.	Sierra	J. F. Cowdery	Yuba	Three log crib dams
227	Marlow	Tuolumne	A. P. Scheld	Tuolumne	Brush and rock dam
228	Last Chance	Plumas	Fred C. DeChaine.	Feather	
229	Barnhardt	Calaveras	Cadematori, Peirano.	Calaveras	Log and brush dam
230	Beattie & Parson's Quartz.	El Dorado	Geo. Beattie	American	
231	Hilda	Sierra	Richard Phelan	Yuba	
232	Alcyone	Calaveras	W. A. Keefer	Calaveras	Dam in San Domingo.
233	French Claim	El Dorado	J. R. Sears	Cosumnes	Log and brush dam
234	Larsen Placer	El Dorado	Emil E. Larsen and John H. Harris.	American	Log dam
235	Miocene	Plumas	W. H. Leek	Feather	Dam in Rush Creek
236	Cascajo	Calaveras	Hugh Craig	Mokelumne	None
237	Mad Mule	Shasta	John Faubel	Sacramento	On bank of Whisky Creek.
238	Blue Eyes	Placer	A. F. Sheehan	American	Log dam
239	Bell & Dorsey	El Dorado	Plymouth Consolidated Gold Mining Co.	Cosumnes	Log and brush dam
240	Gold Run	Placer	E. A. Wiltsee	American	Log dam
241	Craycroft	Sierra	H. Spaulding et al.	Yuba	Log crib dam
242	Clark & Willis	Calaveras	F. B. Clark	Mokelumne	Log and brush dam
243	Albright Placer.	El Dorado	W. H. Albright	American	Log and brush dam
244	Wildcat	Nevada	W. P. Miller	Yuba	
245	Burlington	Sierra	John Freeman	Yuba	Log and brush dam
246	Little Boulder Creek.	Plumas	Isaac Blomquist	Feather	Log and brush dam
247	Eckman & Moulton.	Nevada	D. W. Eckman and W. E. Moulton.	Yuba	Gravel and brush dam
248	Hall & French	Nevada	Thos. Hall and Chas. D. French.	Yuba	Gravel and brush dam
249	Linda Placer	Sierra	David Corbett	Yuba	
250	Divide	El Dorado	James E. Roelke	American	Brush and rock dam
251	Campi Placer	Amador	Eckhart, Solario	Mokelumne	Log and brush dam

of Mines—Continued.

Approximate Amount of Gravel Proposed to Mine—Cu. Yds.	Application Received	Order Issued to Build Impounding Works	License Granted	Mined and Stored Previous to June 1, 1895. Cu. Yds.	Storage Capacity yet Available, Partly or Wholly Completed. Cu. Yds.
1,209,967	Apr. 4				1,500,000
5,000	Apr. 7		Aug. 18,'96		
900,000	Apr. 14	July 27, 1896			
67,000	Apr. 16		July 20,'96		
38,720	May 13	Aug. 18, 1896			
48,400	May 18				
4,000	June 3				
2,000,000	June 6				
30,000	June 8				15,000
3,780,000	June 15	Aug. 18, 1896			
	June 25	Sept. 21, 1896			
	July 20				
	July 25				
	May 1		July 27,'96		4,000,000
	June 11				
	Aug. 5	Aug. 31, 1896			4,000,000
	Aug. 7				
	Aug. 13				
	Aug. 21	Sept. 15, 1896			4,500,000
250,000	Aug. 21	Aug. 25, 1896	Sept. 22,'96		
11,666	Aug. 25	Oct. 13, 1896			15,651
	Aug. 31				
3,872,000	Sept. 13	Oct. 13, 1896			
200,000	Sept. 3	Sept. 28, 1896			200,000
	Sept. 11				
	Sept. 16				
350,000	Sept. 21	Oct. 13, 1896			400,000
	Sept. 24				
	Sept. 28				
4,833	Sept. 30				5,250
20,000	Sept. 30				2,500
	Oct. 2				
	Oct. 7				
177,000	Oct. 9				700,000
208,000	Oct. 9				700,000
12,500	Oct. 9				
6,600	Oct. 14				
9,000	Oct. 17				

FIFTH BIENNIAL REPORT

OF THE

TRUSTEES OF MINERAL CABINET

FOR THE

TWO YEARS ENDING JUNE 30, 1896.

SACRAMENTO:
A. J. JOHNSTON, : : : : SUPERINTENDENT STATE PRINTING.
1896.

To the Honorable James H. Budd, *Governor:*

Sir: The Trustees of the Mineral Cabinet, authorized by an Act of the Legislature entitled "An Act to provide for the removal of the mineral cabinet from the State Library," approved March 9, 1887, have the honor herewith to submit their fifth biennial report.

Respectfully,

J. A. WOODSON,
GEORGE PYBURN,
Trustees.

E. B. Crocker Art Gallery, Sacramento, June 30, 1896.

REPORT OF THE TRUSTEES OF MINERAL CABINET.

The janitor at the E. B. Crocker Art Gallery, where the State Mineral Cabinet is now located and on public view, reports to us that during the two years last past, 18,000 visitors have registered, and that at least one half of these have come to view the mineral exhibit. Since the date of last report, June 30, 1894, no work has been done by the Trustees, either on the cabinet or its contents, or in furtherance of the proposed rearrangement and cataloguing of the specimens. The necessity of avoiding unnecessary outlay in all departments of the government, during the financial stringency of the past two or three years, may be largely credited with this inaction; in consequence, the entire appropriation for the use of this commission for the fiscal years 1893–94 and 1894–95 remains intact in the treasury.

We desire here to repeat what has already been said in our fourth biennial report, viz.: "There remains, in conclusion, only to speak of a matter connected with the future care and custody of the Cabinet. The Act (Assembly Bill No. 134, approved March 9, 1887) creating the commission, 'Trustees of the Mineral Cabinet,' prescribed as the duties of said Trustees, *the removal of Mineral Cabinet from the State Capitol*, where it was at that time situated, *to the E. B. Crocker Art Gallery*, where it now is. They were not charged with the continued or future custody or care of the Cabinet and minerals; nor was any provision made in the Act to that end. But for the fact that certain improvements, in the way of alterations and additions, proposed by the Trustees and sanctioned by the Legislature, were made the subject and cause for appropriations of money out of the funds in the treasury, the prescribed duties of the Trustees would have been fulfilled and their functions terminated. The Cabinet would then have been without any responsible guardian. In view of the near completion of the work of ordering and improving, and the state of affairs contingent thereon, we respectfully suggest that you recommend to the coming Legislature an amendment to Assembly Bill No. 134, aforesaid, making it the duty of the Trustees to continue to keep and care for said Cabinet, provided that no salary shall be paid them for their services."

We would further ask for a small appropriation—say of $250—to enable us to make any necessary repairs, and to complete the rearrangement and cataloguing of the specimens.

Respectfully submitted.

J. A. WOODSON,
GEORGE PYBURN,
Trustees.

NOTE.—Mr. E. J. Gregory, one of the Trustees, having been absent from the State several months, and having again left the State for an indefinite period, the Board has not considered him as one of the Trustees, his absence vacating his office.

BIENNIAL REPORT

OF THE

BOARD OF STATE HARBOR COMMISSIONERS,

FOR THE TWO FISCAL YEARS

COMMENCING JULY 1, 1894, AND ENDING JUNE 30, 1896.

SACRAMENTO:
A. J. JOHNSTON, : : : : SUPERINTENDENT STATE PRINTING.
1896.

REPORT.

To HON. JAMES H. BUDD, *Governor of the State of California :*

DEAR SIR: In compliance with Sections 332 and 2537 of the Political Code, the Board of State Harbor Commissioners submit the following report of their transactions from the 1st of July, 1894, to the 30th of June, 1896, inclusive.

The report gives an account of the moneys received and disbursed, stating specifically the source of receipts and the purposes for which the disbursements have been made. It also furnishes a description of the improvements already made, and the condition of the property under their charge, and the purposes and policy of the Board.

J. J. KEEGAN,
Secretary Board of State Harbor Commissioners.

The tabulated statements hereto annexed give a detailed statement of the receipts and disbursements:

SUMMARY OF RECEIPTS AND DISBURSEMENTS.

	1894–95.	1895–96.	Total.
Receipts.			
From dockage	$179,534 15	$182,884 25	$362,418 40
From tolls	186,468 33	192,423 07	378,891 40
From wharfage	5,011 30	3,563 35	8,574 65
From rents of wharves, seawall lots, special dock privileges, including reserving of berths, ferry slips, Belt Railroad freight sheds and offices	189,153 24	195,010 05	384,163 29
From sale of old material	2,377 01	1,431 61	3,808 62
From dredging	790 00	1,257 75	2,047 75
From Fisherman's Wharf, exclusive of rents	3,818 75	3,900 00	7,718 75
From miscellaneous, damages to property, etc.	9,341 58	1,073 56	10,415 14
From interest, costs, etc.	5 50		5 50
From Belt Railroad, switching	10,118 75	11,730 00	21,848 75
From Belt Railroad, sale of rails, fish-plates, and bolts		5,934 25	5,934 25
Total receipts	$586,618 61	$599,207 89	$1,185,826 50
Amount drawn from San Francisco Harbor Improvement Fund	326,013 26	290,929 16	616,942 42
Totals	$912,631 87	$890,137 05	$1,802,768 92
Disbursements.			
Salaries of Commissioners, Secretaries, Engineers, Draughtsman, Attorney, Wharfingers, Collectors, Watchmen, and Clerks in Secretary's office	$88,312 35	$87,658 80	$175,971 15
Construction, including building of new wharves, slips, sheds, sewers, and roadways, maintenance and repairs of waterfront streets, old wharves, buildings, ferry depot foundation, roadway, and seawall	444,366 85	390,935 35	835,302 20
Wharf cleaning	23,011 88	27,220 09	50,231 97
Dredging	79,664 43	56,639 02	136,303 45
Seawall account	55 00		55 00
General expenses, including office rent, fuel, stationery, printing, legal expenses, lighting wharves, overpaid revenue returned, and other incidental expenses	26,360 32	20,388 24	46,748 56
Belt Railroad construction and maintenance	30,755 26	15,189 01	45,944 27
Fire account	4,827 05	6,582 96	11,410 01
Total disbursements	$697,353 14	$604,613 47	$1,301,966 61
Amount remitted to State Treasurer	215,278 73	285,523 58	500,802 31
Totals	$912,631 87	$890,137 05	$1,802,768 92

During the last two fiscal years there was collected the sum of $1,185,826 50, and expended $1,301,966 61, exclusive of the money transferred by the Controller from the San Francisco Harbor Improvement Fund to the San Francisco Depot Sinking Fund. The money thus transferred by the authority of an Act approved March 17, 1891, amounts to $111,144, which would bring the total expenditures to $1,413,110 61.

The following shows the condition of the San Francisco Harbor Improvement Fund June 30, 1896:

Amount in fund July 1, 1894	$309,729 04	
Amount remitted to June 30, 1896	500,802 31	
		$810,531 35

Amount drawn out to June 30, 1896 (ordinary expenditures)	$616,942 42	
Amount transferred to San Francisco Depot Sinking Fund by Controller	111,144 00	
Amount in fund July 1, 1896	82,444 93	
		$810,531 35

The following shows the condition of the San Francisco Depot Sinking Fund June 30, 1896:

Amount in fund July 1, 1894	$78,727 00	
Amount remitted to June 30, 1896	111,144 00	
		$189,871 00
Amount drawn out to June 30, 1896 (purchase of United States bonds by Treasurer)	$135,976 40	
Amount drawn out to June 30, 1896 (expenses by Treasurer)	303 95	
Amount in fund July 1, 1896	53,590 65	
		$189,871 00

The following shows the condition of the San Francisco Depot Fund June 30, 1896:

Amount in fund July 1, 1894	$607,125 00
Amount drawn out to June 30, 1896	9,597 44
Amount in fund July 1, 1896	$597,527 56

The following shows the condition of the various funds in the State Treasury appertaining to the Board of State Harbor Commissioners:

San Francisco Harbor Improvement Fund		$82,444 93
San Francisco Depot Sinking Fund (bond account)	$135,976 40	
San Francisco Depot Sinking Fund (cash balance)	53,590 65	
		189,567 05
San Francisco Depot Fund		597,527 56
		$869,539 54

SAN FRANCISCO DEPOT SINKING FUND.

The following is a synopsis of the statement furnished by State Treasurer Rackliffe:

Total amount transferred from the San Francisco Harbor Improvement Fund to the San Francisco Depot Sinking Fund		$189,871 00
Interest on United States bonds purchased		5,400 00
Total		$195,271 00
United States bonds purchased	$120,000 00	
Premium paid on same	15,887 50	
Expenses entailed in purchase	303 95	
Interest accrued prior to purchase	88 90	
Interest paid on $600,000 San Francisco Depot bonds	36,000 00	
Total		172,280 35
On hand—		
Cash		$22,990 65
United States bonds		120,000 00
Total		$142,990 65

COMPARATIVE STATEMENT OF RECEIPTS AND DISBURSEMENTS—1863-1896.

Fiscal Year.	Receipts.	Expenses.	Percentage per Year	Construction and Repairs.	Seawall	Dredging.	Purchase of Dredgers, Scows, and Repairs	Constructing and Operating Belt Railroad	Miscellaneous.	Remit'd State Treasurer	Drawn from State Treasurer
From the Organization of the Commission.	From Dockage, Tolls, Wharfage, Rents, etc.	Salaries (Commissioners, Secretaries, Clerks, Wharfingers, Collectors) Law Fees, Fuel, Rent, Printing, Stationery, etc.		Building Sheds, Wharves, Bulkheads, etc., Ferry Foundation and Repairs on Same.		All Dredging up to 1874 was done under Contract. Since by Commissioners.					
1863-64	$117,848 28	$25,354 84	21.50	$67,599 82					$976 25	$71,897 39	$47,680 02
1864-65	177,393 66	32,439 10	18.28	80,875 15						123,365 23	62,334 82
1865-66	183,716 80	35,531 42	19.02	19,065 42	$3,607 00	$44,106 50				132,023 96	47,568 50
1866-67	336,409 36	41,233 95	11.95	88,525 78	266 50	10,300 00			330 62	268,573 45	64,345 94
1867-68	294,304 28	55,531 92	18.87	82,791 27	250,991 97	41,021 00			561 18	217,528 06	354,121 12
1868-69	287,890 53	52,130 77	18.11	38,779 83	262,323 13	32,338 00				212,532 07	310,213 27
1869-70	252,649 56	54,684 40	21.65	35,545 04	165,892 68	80,100 00				180,623 37	272,670 93
1870-71	148,917 03	37,782 65	25.37	53,693 31		35,258 00				96,097 20	73,914 13
1871-72	195,031 14	61,006 70	31.28	28,146 62		53,944 40				105,877 82	53,944 40
1872-73	190,330 47	69,858 63	36.50	78,776 28		32,293 20				91,042 59	80,640 23
1873-74	265,709 06	77,938 05	29.33	104,175 98	2,321 85	42,478 56	$34,070 00		6,344 01	166,150 23	168,769 62
1874-75	373,541 72	68,617 14	18.37	209,540 80	1,078 25	33,835 71	3,725 00		924 99	245,369 00	189,549 17
1875-76	372,078 74	65,976 57	17.73	162,000 25		40,802 70			565 47	249,450 44	146,716 69
1876-77	448,087 25	79,208 85	17.68	284,023 05		25,252 94	15,354 45			310,909 33	266,661 37
1877-78	446,516 82	84,326 72	18.88	112,628 95	4,803 38	38,214 40	82,068 79		1,665 88	285,521 50	162,712 80
1878-79	466,420 55	97,162 63	20.83	164,560 55	107,091 87	60,454 68	3,948 84		595 50	274,370 87	241,764 39
1879-80	427,687 56	100,667 57	23.53	141,022 14	309,652 90	51,675 28	1,173 50		2,510 53	240,414 91	419,429 27
1880-81	419,437 49	102,746 75	24.49	199,972 97	383,174 96	51,462 52			4,785 32	201,782 41	527,487 44
1881-82	355,005 64	104,255 15	22.91	86,102 58	92,804 98	48,743 45			4,320 00	249,919 90	131,140 42
1882-83	436,030 54	107,883 69	24.74	179,089 82	34,949 22	51,457 50	5,247 00		28,129 37	194,860 84	165,586 90
1883-84	501,243 25	115,231 30	22.98	173,997 19	76,461 63	60,780 40			6,863 55	254,497 78	186,588 60
1884-85	500,702 10	116,194 14	23.20	248,607 11	195,706 95	52,258 80			4,933 50	259,702 01	376,700 41
1885-86	483,851 04	117,693 22	24.32	197,612 03	157,953 82	46,675 40			4,324 00	249,431 18	289,838 61
1886-87	527,890 96	128,584 90	24.35	153,529 29	53,403 50	78,046 99			5,742 95	245,509 83	136,926 50
1887-88	580,152 51	138,993 05	23.95	294,855 61	36,360 98	54,082 70			5,450 62	294,861 66	244,452 11
1888-89	619,537 54	139,552 66	20.91	231,353 84	101,586 24	62,424 96			10,152 33	321,605 12	247,137 61
1889-90	599,105 58	131,262 56	21.91	301,063 18	115,419 48	51,588 91			5,257 21	306,148 20	311,633 96
1890-91	600,821 20	115,579 39	19.23	269,542 63	65,810 20	53,230 81		$327 61	9,600 62	319,721 19	232,991 25
1891-92	651,112 11	114,860 89	17.64	275,083 97	122,112 90	56,081 70		81,307 46	7,663 95	360,206 68	366,205 44
1892-93	629,957 55	121,882 55	19.34	319,991 36	72,025 44	54,871 48	35,384 00	15,933 10	5,771 81	334,575 70	320,477 89
1893-94	583,674 58	123,039 43	21.08	338,570 00	23,158 22	58,357 87		14,643 63	4,815 50	281,417 59	260,327 66
1894-95	586,618 61	137,684 55	23.47	444,366 85	55 00	48,132 14	31,532 29	30,755 26	4,827 05	215,278 73	326,013 26
1895-96	599,207 89	135,267 13	22.57	390,935 35		50,295 44	6,343 58	15,189 01	6,582 96	285,523 58	290,929 16
Totals	$13,758,881 40	$2,990,163 27		$5,856,424 02	$2,639,013 05	$1,500,566 44	$208,847 45	$158,156 07	$133,395 17	$7,649,789 82	$7,377,473 89
Balance in Treasury June 30, 1896											82,444 93
Total											$7,459,918 82
Balance in San Francisco Depot Sinking Fund June 30, 1894											78,727 00
Amount transferred to San Francisco Depot Sinking Fund, fiscal years 1894-95 and 1895-96											111,144 00
Total											$7,649,789 82

The following is a table of the receipts and disbursements for the two fiscal years ending June 30, 1896, showing whence the revenue was derived, and the purposes for which it was expended:

RECEIPTS AND DISBURSEMENTS FOR THE TWO FISCAL YEARS ENDING JUNE 30, 1896.

Receipts.	1894-95.	1895-96.	Total.
Section 1, Seawall Wharf	$8,222 23	$8,081 71	$16,303 94
Section 2, Seawall Wharf	5,864 09	4,245 35	10,109 44
Section 3, Seawall Wharf	14,651 11	11,581 41	26,232 52
Section 4, Seawall Wharf	4,918 16	7,957 12	12,875 28
Fisherman's Wharf	4,517 75	4,459 00	8,976 75
Union-Street Wharf	13,310 16	16,660 32	29,970 48
Green-Street Wharf	15,862 51	17,000 99	32,863 50
Vallejo-Street Wharf	10,022 73	12,052 44	22,075 17
Broadway Wharf, No. 1	14,277 96	16,554 15	30,832 11
Broadway Wharf, No. 2	13,773 78	14,645 11	28,418 89
Pacific-Street Wharf	17,171 48	1,610 38	18,781 86
Jackson-Street Wharf	17,531 02	15,890 73	33,421 75
Washington-Street Wharf	15,928 72	17,139 14	33,067 86
Ferries	91,887 98	85,851 61	177,739 59
Mission-Street Wharf	13,471 36	13,700 22	27,171 58
Mission-Street Wharf, No. 2	20,910 03	24,074 95	44,984 98
Howard-Street Wharf	8,930 03	10,689 68	19,619 71
Howard-Street Wharf, No. 2	10,307 45	9,722 01	20,029 46
Howard-Street Wharf, No. 3	8,002 10	11,024 47	19,026 57
Folsom-Street Wharf	9,239 31	9,817 10	19,056 41
Folsom-Street Wharf, No. 2	13,541 80	22,753 55	36,295 35
Harrison-Street Wharf	9,128 70	12,302 62	21,431 32
Steuart-Street Wharf	9,587 49	9,709 75	19,297 24
Spear-Street Wharf	13,462 99	13,880 50	27,343 49
Main-Street Wharf	15,040 72	14,410 35	29,451 07
Beale-Street Wharf	19,824 00	21,397 95	41,221 95
Fremont-Street Wharf	4,044 60	7,237 25	11,281 85
Third-Street Wharf	9,859 63	8,188 57	18,048 20
Berry-Street Wharf	12,999 46	13,211 28	26,210 74
Channel-Street Wharf	4,916 70	5,445 17	10,361 87
Center-Street Wharf	3,777 60	1,986 05	5,763 65
California Dry Dock	6,100 00	6,600 00	12,700 00
Pacific Mail Steamship Co.	21,600 00	21,600 00	43,200 00
Southern Pacific Company (rent)	19,200 00	19,200 00	38,400 00
Southern Pacific Company (tolls)	54,422 12	55,136 29	109,558 41
United States Barge Office	240 00	240 00	480 00
Space for scales	1,185 00	960 00	2,145 00
China Basin		1,000 00	1,000 00
Revenue from seawall lots	10,520 00	11,313 50	21,833 50
Sale of old material (urgent repairs)	2,070 81	1,388 61	3,459 42
Sale of old material (pile-driving)	192 48		192 48
Sale of old material (Dredger No. 1)		27 35	27 35
Sale of old material (Dredger No. 2)	113 72	15 65	129 37
Dredging (Dredger No. 1)	160 00	1,257 75	1,417 75
Dredging (Dredger No. 2)	630 00		630 00
Central Basin	240 00	350 00	590 00
Belt Railroad revenue	24,518 75	33,064 25	57,583 00
Suspense account			
Interest and costs	5 50		5 50
Cousins Dry Dock Co.	1,100 00	2,700 00	3,800 00
Damages, sales, etc.	9,336 58	1,073 56	10,410 14
	$586,618 61	$599,207 89	$1,185,826 50
Amount drawn from San Francisco Harbor Improvement Fund	326,013 26	290,929 16	616,942 42
Totals	$912,631 87	$890,137 05	$1,802,768 92

Receipts and Disbursements for Two Years Ending June 30, 1896—Continued.

Disbursements.	1894-95.	1895-96.	Total.
Salaries of Commissioners, Secretaries, and Clerks	$18,540 00	$20,390 00	$38,930 00
Salaries of Chief Engineer and Assistants	8,075 50	7,458 00	15,533 50
Salaries of Chief Wharfinger and Assistants	5,175 00	4,875 00	10,050 00
Salary of Attorney	2,400 00	2,400 00	4,800 00
Salaries of Wharfingers	31,500 00	28,969 35	60,469 35
Salaries of Collectors	19,071 00	19,196 65	38,267 65
Salaries of Watchmen	3,550 85	4,369 80	7,920 65
Expense Account	17,961 44	16,734 60	34,696 04
Urgent repairs	37,596 10	47,084 22	84,680 32
Repairs (contract)	156,858 15	105,037 00	261,895 15
Pile-driving	24,933 02	24,606 91	49,539 93
Cleaning wharves	23,011 88	27,220 09	50,231 97
Wharf offices and furniture	637 28	940 21	1,577 49
Legal expenses	6,042 20	1,378 75	7,420 95
Fire Account	4,827 05	6,582 96	11,410 01
Dredger No. 1	19,026 98	17,580 57	36,607 55
Dredger No. 2	22,598 97	13,794 89	36,393 86
Tug "Gov. Markham"	11,708 47	11,129 77	22,838 24
Tug "Gov. Irwin"	26,330 01	14,133 79	40,463 80
Construction Account	224,979 58	214,207 22	439,186 80
Seawall Account	55 00		55 00
Improving seawall lots			
Dockage refunded	265 65	284 52	550 17
Tolls refunded	442 25	226 70	668 95
Wharfage refunded	61 90	43 00	104 90
Rent refunded	225 00	77 00	302 00
Fisherman's Wharf (expenses)	105 25	60 00	165 25
Profit and Loss Account			
Belt Railroad construction	18,463 00		18,463 00
Belt Railroad expense	12,292 26	15,189 01	27,481 27
San Francisco Harbor Improvement Fund			
Closed accounts			
Damages, sales, etc.	619 35	643 46	1,262 81
	$697,353 14	$604,613 47	$1,301,966 61
Remitted to State Treasurer, account San Francisco Harbor Improvement Fund	215,278 73	285,523 58	500,802 31
	$912,631 87	$890,137 05	$1,802,768 92

STATEMENT OF SAN FRANCISCO HARBOR IMPROVEMENT FUND FOR TWO FISCAL YEARS ENDING JUNE 30, 1896.

	Dr.		
1894—Aug.	To amount remitted by Commissioners for July	$19,219 97	
Sept.	To amount remitted by Commissioners for Aug.	16,975 54	
Oct.	To amount remitted by Commissioners for Sept.	20,665 11	
Nov.	To amount remitted by Commissioners for Oct.	14,186 52	
Dec.	To amount remitted by Commissioners for Nov.	21,129 30	
1895—Jan.	To amount remitted by Commissioners for Dec.	20,684 47	
Feb.	To amount remitted by Commissioners for Jan.	19,614 81	
March	To amount remitted by Commissioners for Feb.	11,697 55	
April	To amount remitted by Commissioners for Mar.	13,291 20	
May	To amount remitted by Commissioners for Apr.	22,893 83	
June	To amount remitted by Commissioners for May	18,151 74	
July	To amount remitted by Commissioners for June	16,768 69	
			$215,278 73
1895—Aug.	To amount remitted by Commissioners for July	$23,459 33	
Sept.	To amount remitted by Commissioners for Aug.	18,896 00	
Oct.	To amount remitted by Commissioners for Sept.	23,376 05	
Nov.	To amount remitted by Commissioners for Oct.	23,449 38	
Dec.	To amount remitted by Commissioners for Nov.	25,784 08	
1896—Jan.	To amount remitted by Commissioners for Dec.	28,739 85	
Feb.	To amount remitted by Commissioners for Jan.	21,781 09	
March	To amount remitted by Commissioners for Feb.	28,851 10	
April	To amount remitted by Commissioners for Mar.	23,075 99	
May	To amount remitted by Commissioners for Apr.	25,114 13	
June	To amount remitted by Commissioners for May	20,985 12	
July	To amount remitted by Commissioners for June	22,011 46	
			285,523 58
	Total amount remitted		$500,802 31
	Balance in S. F. Harbor Imp. F'd, July, 1894		309,729 04
			$810,531 35

Cr. SAN FRANCISCO HARBOR IMPROVEMENT FUND—Continued.

Date.	Order.	No.	On Account of—	Amount.
1894.				
July 6	B. McMahon & Son	674	Car Ferry Slip No. 2	$7,791 88
July 19	William Deacon	675	Alterations tug "Gov. Irwin"	2,241 56
July 19	A. Page Brown	676	Plans and specifications, ferry depot	6,250 00
July 26	S. E. Slade Lumber Co.	677	Lumber	3,242 30
July 26	S. E. Slade Lumber Co.	678	Piles	1,046 01
Aug. 2	S. F. Bridge Co.	679	Ferry foundation	11,224 80
Aug. 2	A. Page Brown	680	Architect fees	187 08
Aug. 16	Moynihan & Aitken	681	Boiler for tug "Gov. Irwin"	2,840 62
Aug. 23	Wood, Slade & Thayer Lumber Co.	682	Piles	631 96
Aug. 23	Wood, Slade & Thayer Lumber Co.	683	Lumber	3,760 17
Aug. 30	Teredo Proof Pile Co.	684	Piles	3,499 88
Sept. 6	J. D. Spreckels & Bros. Co.	685	Cement	24,438 75
Sept. 6	S. F. Bridge Co.	686	Ferry foundations	20,656 12
Sept. 6	Darby Laydon & Co.	688	Folsom-Street Pier No. 2	1,665 00
Sept. 6	A. Page Brown	689	Architect fees	344 27
Sept. 13	Teredo Proof Pile Co.	690	Piles	1,166 62
Sept. 13	Wood, Slade & Thayer Lumber Co.	691	Lumber	2,579 65
Sept. 28	Darby Laydon & Co.	692	Repairs to Folsom Pier No. 2	3,707 00
Oct. 1	S. F. Bridge Co.	693	Ferry foundation	12,430 12
Oct. 2	A. Page Brown	694	Architect fees	207 17
Oct. 25	Wood, Slade & Thayer Lumber Co.	695	Piles	1,697 77
Oct. 25	Wood, Slade & Thayer Lumber Co.	696	Lumber	2,180 14
Nov. 1	S. F. Bridge Co.	697	Ferry foundation	18,024 75
Nov. 1	A. Page Brown	698	Architect fees	480 41

Cr. SAN FRANCISCO HARBOR IMPROVEMENT FUND—Continued.

Date.		Order.	No.	On Account of—	Amount.
1894.					
Nov.	27	Wood, Slade & Thayer Lumber Co.	699	Lumber	$2,738 87
Nov.	27	Wood, Slade & Thayer Lumber Co.	701	Piles	2,495 64
Dec.	6	Moynihan & Aitken	702	Boiler tug "Gov. Irwin"	2,350 38
Dec.	6	S. F. Bridge Co.	703	Ferry foundation	3,928 01
Dec.	6	A. Page Brown	704	Architect fees	65 47
Dec.	11	Atlas Iron Works	705	Hydraulic hoist, Slip No. 6	1,237 50
Dec.	11	William Deacon	706	Alteration tug "Gov. Irwin"	1,743 44
Dec.	13	J. D. Spreckels & Bros. Co.	707	Cement for ferry foundation	7,980 00
Dec.	20	S. E. Slade	708	Piles	1,337 95
Dec.	20	S. E. Slade	709	Lumber	1,846 05
Dec.	20	Wood, Slade & Thayer Lumber Co.	710	Lumber	1,071 95
Dec.	20	City Street Improvement Co.	712	Paving	2,250 00
Dec.	27	F. A Williams	713	Freight shed on Seawall Lot No. 8	2,897 77
1895.					
Jan.	3	S. F. Bridge Co	714	Ferry foundation	3,875 11
Jan.	3	A. Page Brown	715	Architect fees	64 59
Jan.	12	F. A. Williams	716	Freight shed on Seawall Lot No. 8	1,395 23
Jan.	17	Atlas Iron Works	717	Hydraulic hoist, Slip No. 6	412 50
Jan.	22	S. E. Slade	718	Piles	1,907 77
Jan.	22	S. E. Slade	719	Lumber	1,411 08
Feb.	5	Darby Laydon & Co.	720	Dry dock at Spear-Street Wharf	1,371 90
Feb.	5	Darby Laydon & Co.	721	Repiling Fremont Street and making dry dock slips	4,076 25
Feb.	5	S. F. Bridge Co.	722	Ferry foundation	5,071 18
Feb.	5	A. Page Brown	723	Architect fees	84 52
Feb.	14	City Street Improvement Co.	724	Paving and bituminous rock in front slips 2 and 3	2,367 79
Feb.	19	City Street Improvement Co.	725	Bituminous rock pavement, ferry foundation	2,437 76
Feb.	21	S. E. Slade Lumber Co.	726	Piles	1,813 77
Feb.	21	S. E. Slade Lumber Co.	727	Lumber	2,586 62
Feb.	26	Randell Hunt	728	Car Ferry Slip No. 1	2,832 00
Mar.	5	Darby Laydon & Co	729	Dry dock, Spear Street	1,714 87
Mar.	5	Darby Laydon & Co.	730	Fremont-Street pier	1,443 75
Mar.	5	Teredo Proof Pile Co.	731	Piles	6,032 40
Mar.	7	City Street Improvement Co.	732	Paving Seawall Lot No. 8	1,618 96
Mar.	7	S. F. Bridge Co.	733	Ferry foundation	4,861 12
Mar.	7	A. Page Brown	734	Architect fees	81 02
Mar.	21	S. E. Slade Lumber Co.	735	Piles	1,968 07
Mar.	21	S. E. Slade Lumber Co.	736	Lumber	1,923 37
Mar.	26	Randell Hunt	737	Car Ferry Slip No. 1	3,168 75
Mar.	26	Darby Laydon & Co.	738	Spear-Street dry dock	6,855 99
April	4	S. F. Bridge Co.	739	Ferry foundation	11,981 95
April	4	A. Page Brown	740	Architect fees	418 70
April	4	Darby Laydon & Co	741	Fremont-Street pier	5,967 81
April	23	S. E. Slade Lumber Co.	742	Lumber	2,645 87
April	23	S. E. Slade Lumber Co.	743	Piles	2,323 61
April	26	Teredo Proof Pile Co.	744	Piles	3,591 00
April	30	Randell Hunt	745	Car Ferry Slip No. 1	2,889 25
May	2	S. F. Bridge Co.	746	Ferry foundation	12,667 45
May	21	Teredo Proof Pile Co.	747	Piles	5,347 50
May	21	Paraffine Paint Co.	748	Coating piles	1,661 15
May	23	S. E. Slade Lumber Co.	749	Lumber	4,048 67
May	23	S. E. Slade Lumber Co.	750	Piles	4,499 94
May	23	Healy, Tibbitts & Co	751	Clay-Street Pier No. 1	1,364 55
May	23	Vulcan Iron Works	752	Hydraulic hoist, Slip No. 3	1,094 40
May	28	Teredo Proof Pile Co.	753	Piles	2,208 00
June	4	S. F. Bridge Co.	754	Ferry foundation	11,628 89
June	4	Teredo Proof Pile Co.	755	Piles	6,015 00
June	4	Paraffine Paint Co.	756	Coating piles	1,939 92
June	4	Darby Laydon & Co.	757	Bulkhead, Beale and Fremont Sts.	261 25
June	11	Healy, Tibbitts & Co.	758	Repairs, Broadway No. 1	766 71
June	11	Darby Laydon & Co.	759	Coal platform	1,027 00

Cr. SAN FRANCISCO HARBOR IMPROVEMENT FUND—Continued.

Date.	Order.	No.	On Account of—	Amount.
1895.				
June 17	Vulcan Iron Works	760	Hydraulic hoist, Slip No. 3	$729 60
June 20	S. F. Bridge Co.	761	Dredging Channel Street	3,444 80
June 25	Paraffine Paint Co.	762	Coating piles	1,362 31
June 25	S. E. Slade Lumber Co.	763	Piles	1,159 34
June 25	S. E. Slade Lumber Co.	764	Lumber	4,126 06
				$320,784 16
1894.	The following warrants, aggregating $5,229 10, were drawn against the San Francisco Harbor Improvement Fund by the State Controller:			
Aug. 1	S. F. Chronicle	1104	Advertising	33 60
Aug. 1	S. F. Bulletin	1105	Advertising	52 50
Aug. 1	Oakland Enquirer	1106	Advertising	12 60
Aug. 1	L. A. Times-Mirror Co.	1107	Advertising	12 00
Aug. 1	L. A. Evening Express Co.	1108	Advertising	14 40
Aug. 1	Sacramento Pub. Co.	1109	Advertising	24 00
Aug. 1	James McClatchy & Co., Sacramento	1110	Advertising	40 00
Sept. 17	Oakland Tribune	2461	Advertising	40 00
1895.				
Mar. 25	James A. Johnson		Legal services	2,000 00
April 1	John B. Mhoon		Legal services	3,000 00
			Total drawn for fiscal year 1894-95	$326,013 26
1895.				
July 2	S. F. Bridge Co.	765	Ferry foundation	$10,472 54
July 10	Healy, Tibbitts & Co.	766	Driving piles, Slip No. 7	433 97
July 23	Darby Laydon & Co.	767	Driving piles at Howard Nos. 1 and 3	551 38
July 23	S. E. Slade Lumber Co.	768	Lumber	2,404 95
July 23	S. E. Slade Lumber Co.	769	Piles	4,935 82
July 25	Pope & Talbot	770	Piles	598 78
July 25	Pope & Talbot	771	Lumber	1,118 60
July 25	Darby Laydon & Co.	772	Repiling Steuart-Street Wharf	500 63
Aug. 1	S. F. Bridge Co.	773	Ferry foundation	10,069 22
Aug. 6	Teredo Proof Pile Co.	774	Piles	4,089 37
Aug. 13	James A. McMahon	775	Rebuilding Folsom-Street Pier No. 2	865 20
Aug. 27	Pope & Talbot	776	Lumber	4,688 04
Aug. 27	Pope & Talbot	777	Piles	1,184 28
Aug. 27	James A. McMahon	778	Rebuilding Folsom-Street Pier No. 2	782 80
Aug. 29	Teredo Proof Pile Co.	779	Piles	1,363 13
Sept. 3	S. F. Bridge Co.	780	Ferry foundation	11,201 49
Sept. 12	Teredo Proof Pile Co.	781	Piles	2,557 50
Sept. 12	Atlas Iron Works	782	Hydraulic hoist, Ferry Slip No. 2	1,218 00
Sept. 18	A. Page Brown	783	Architect's fees	236 56
Sept. 18	A. Page Brown	784	Architect's fees	211 12
Sept. 18	A. Page Brown	785	Architect's fees	566 82
Sept. 18	A. Page Brown	786	Architect's fees	174 54
Sept. 18	A. Page Brown	787	Architect's fees	193 81
Sept. 26	J. D. Spreckels & Bros. Co.	788	Cement, account ferry foundation	16,126 25
Sept. 26	Pope & Talbot	789	Piles	3,118 57
Sept. 26	Pope & Talbot	790	Lumber	4,560 66
Oct. 1	James A. McMahon	791	Constructing portions of ferry slips	1,049 62
Oct. 8	S. F. Bridge Co.	792	Ferry foundation	59,944 40
Oct. 10	Thomson Bridge Co.	793	Building four sheds at ferry slips	2,292 50
Oct. 17	City Street Imp. Co.	794	Paving in front Ferry Slips Nos. 2, 3, 4	1,320 56
Oct. 17	Teredo Proof Pile Co.	795	Piles	4,369 75
Oct. 24	Paraffine Paint Co.	796	Coating piles	1,431 34
Oct. 24	Pope & Talbot	797	Piles	953 86
Oct. 24	Pope & Talbot	798	Lumber	2,738 34
Oct. 29	Teredo Proof Pile Co.	799	Piles	2,681 00
Nov. 12	Healy, Tibbitts & Co.	800	Constructi'g shed on Clay-St. Wharf	1,383 00
Nov. 21	Paraffine Paint Co.	801	Coating piles	374 06
Nov. 26	Pope & Talbot	802	Piles	1,326 96
Nov. 26	Pope & Talbot	803	Lumber	3,283 08
Dec. 3	S. F. Bridge Co.	804	Pacific-Street Wharf	5,279 25
Dec. 3	Thomas H. Soule	805	Houses over aprons at Slips 2, 5, 6	1,662 00
Dec. 13	Teredo Proof Pile Co.	806	Piles	1,364 30
Dec. 13	Atlas Iron Works	807	Hydraulic hoist, Ferry Slip No. 2	522 00

Cr. SAN FRANCISCO HARBOR IMPROVEMENT FUND—Continued.

Date.	Order.	No.	On Account of—	Amount.
1895.				
Dec. 24	Teredo Proof Pile Co.	808	Piles	$863 80
Dec. 24	Pope & Talbot	809	Piles	119 73
Dec. 24	Pope & Talbot	810	Lumber	3,157 39
1896.				
Jan. 2	Fulton Engineering and Ship Building Works	811	Hydraulic hoist, Upper Deck Landing	744 00
Jan. 2	S. F. Bridge Co.	812	Pacific-Street Wharf	6,660 00
Jan. 2	Thomas H. Soule	813	Houses over aprons at Slips 2, 5, 6	3,878 00
Jan. 2	James A. McMahon	814	Constructing portions of ferry slips	3,015 00
Jan. 2	Teredo Proof Pile Co.	815	Piles	837 90
Jan. 9	Teredo Proof Pile Co.	816	Piles	847 00
Jan. 23	Pope & Talbot	817	Lumber	3,122 27
Jan. 23	Pope & Talbot	818	Piles	330 13
Jan. 28	Teredo Proof Pile Co.	819	Piles	1,085 00
Jan. 30	James A. McMahon	820	Constructing portions of ferry slips	3,710 38
Feb. 4	S. F. Bridge Co.	821	Pacific-Street Wharf	5,610 00
Feb. 4	Teredo Proof Pile Co.	822	Piles	1,940 75
Feb. 6	Fulton Engineering and Ship Building Works	823	Hydraulic hoist, Upper Deck Landing	496 00
Feb. 11	Teredo Proof Pile Co.	824	Piles	812 00
Feb. 18	Teredo Proof Pile Co.	825	Piles	840 00
Feb. 18	Pope & Talbot	826	Lumber	2,027 77
Feb. 25	S. E. Slade Lumber Co.	827	Lumber	1,029 26
Feb. 27	Teredo Proof Pile Co.	828	Piles	3,986 50
Feb. 27	Cotton Bros. & Co.	829	Removing Pier No. 51 and rebuilding Pier No. 8	2,179 50
Mar. 5	Teredo Proof Pile Co.	830	Piles	2,978 50
Mar. 5	S. F. Bridge Co.	831	Pacific-Street Wharf	3,969 00
Mar. 17	Teredo Proof Pile Co.	832	Piles	1,400 00
Mar. 17	Cotton Bros. & Co.	833	Removing Pier No. 51 and rebuilding Pier No. 8	1,805 31
Mar. 24	B. McMahon	834	Repairing and rebuilding dolphins at Slips Nos. 4, 5, and 6	2,503 17
Mar. 24	Paraffine Paint Co.	835	Coating piles	2,315 88
Mar. 24	Darby Laydon & Co.	836	Piles	1,388 25
Mar. 24	S. E. Slade Lumber Co.	837	Lumber	3,884 89
Mar. 26	Teredo Proof Pile Co.	838	Piles	1,579 90
April 6	S. F. Bridge Co.	839	Pacific-Street Wharf	16,460 25
April 6	Teredo Proof Pile Co.	840	Piles	2,744 00
April 16	Teredo Proof Pile Co.	841	Piles	1,512 00
April 23	Williams Asphaltum Block Paving Co.	842	Paving Pacific-Street Wharf	3,734 64
April 23	Darby Laydon & Co.	843	Piles	715 39
April 23	S. E. Slade Lumber Co.	844	Lumber	2,732 92
May 7	Teredo Proof Pile Co.	845	Piles	1,375 50
May 12	Teredo Proof Pile Co.	846	Piles	1,757 00
May 26	Teredo Proof Pile Co.	847	Piles	1,074 50
May 26	S. E. Slade Lumber Co.	848	Lumber	2,491 16
June 2	Main St. Iron Works	849	Alteration machinery "Gov. Irwin"	1,500 00
June 23	Teredo Proof Pile Co.	850	Piles	2,240 00
June 23	Darby Laydon & Co.	851	Piles	1,182 00
June 23	S. E. Slade Lumber Co.	852	Lumber	1,948 65
June 25	Healy, Tibbitts & Co.	853	Shed on Pacific-Street Wharf	4,143 82
			Total drawn for fiscal year 1895–96	$290,929 16

Total amount drawn from San Francisco Harbor Improvement Fund for the two fiscal years ending June 30, 1896	$616,942 42
Total amount transferred to San Francisco Depot Sinking Fund for the two fiscal years ending June 30, 1896	111,144 00
Balance in San Francisco Harbor Improvement Fund June 30, 1896	82,444 93
	$810,531 35

STATEMENT OF SAN FRANCISCO DEPOT SINKING FUND.

1894.			
July 1.	To am't transferred from S. F. Harbor Imp. Fund	$4,631 00	
Aug. 1.	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
Sept. 1.	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
Oct. 1.	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
Nov. 1.	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
Dec. 1.	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
1895.			
Jan. 1.	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
Feb. 1.	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
Mar. 1.	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
Apr. 1.	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
May 1.	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
June 1.	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
			$55,572 00
July 1.	To am't transferred from S. F. Harbor Imp. Fund	$4,631 00	
Aug. 1.	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
Sept. 1.	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
Oct. 1.	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
Nov. 1.	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
Dec. 1.	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
1896.			
Jan. 1.	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
Feb. 1.	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
Mar. 1.	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
Apr. 1.	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
May 1.	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
June 1.	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
			55,572 00
			$111,144 00
	Balance in Fund, June 30, 1894		78,727 00
			$189,871 00

BALANCE SHEET.

From November 4, 1863, to June 30, 1896.

RECEIPTS.			
From dockage, tolls, wharfage, rents, etc.			$13,758,881 40
DISBURSEMENTS.			
Salaries of Commissioners, Secretaries, Engineers, Attorneys, Wharfingers, and Collectors, law fees, fuel, electric lights, rents, stationery, etc.		$2,990,163 27	
Constructing and repairing wharves, sheds, etc.		5,856,424 02	
Constructing seawall and improving seawall lots		2,639,013 05	
Purchase of and constructing dredgers, tugs, and scows		208,847 45	
Dredging, cost of		1,500,566 44	
Payroll of crew of fire-boat		79,539 48	
Suspense account (defalcations)		5,460 55	
Miscellaneous (damages to wharves, dockage, tolls, etc., returned)		48,395 14	
Constructing and operating Belt Railroad		158,156 07	
Cash in treasury		82,444 93	
Balance in S. F. Depot Sinking F'd, June 30, 1894	$78,727 00		
Amount transferred to S. F. Depot Sinking Fund from July 1, 1894, to June 30, 1896	111,144 00		
		189,871 00	
			$13,758,881 40
Dr. CASH.			
To amount remitted to State Treasurer			$7,649,789 82
Cr. CASH.			
By amount drawn from State Treasury		$7,377,473 89	
By cash on hand in Treasury		82,444 93	
By amount transferred to S. F. Depot Sinking Fund		189,871 00	
			$7,649,789 82

CONSTRUCTION ACCOUNT No. 1.

WORK UNDER WAY AT THE DATE OF THE LAST BIENNIAL REPORT, AND SINCE COMPLETED.

Foundation and approach to Union Ferry Depot. San Francisco Bridge Co., contractors. Date of contract, May 23, 1893.

Contract price		$247,887 00
Deduction for modification of contract prior to June 30, 1894	$1,639 90	
Deduction for modification of contract subsequent to June 30, 1894—		
In tower foundation	4,432 50	
In granite levelers for tower	1,087 00	
Deduction for change from stepping on piers to slopes, and omission of plastering of soffits to arches	950 00	
		8,109 40
Net contract price		$239,777 60
Paid prior to June 30, 1894	$31,740 45	
Paid August 2, 1894	11,224 80	
Paid September 6, 1894	20,656 12	
Paid October 2, 1894	12,430 12	
Paid November 1, 1894	18,024 75	
Paid December 6, 1894	3,928 01	
Paid January 3, 1895	3,875 11	
Paid February 5, 1895	5,071 18	
Paid March 7, 1895	4,861 12	
Paid April 4, 1895	11,981 95	
Paid May 2, 1895	12,667 45	
Paid June 4, 1895	11,628 89	
Paid July 2, 1895	10,472 54	
Paid August 1, 1895	10,069 22	
Paid September 3, 1895	11,201 49	
Paid October 8, 1895	59,944 40	
		$239,777 60

Cement for foundation and approaches to Union Depot. J. D. Spreckels & Bros. Co., contractors. Date of contract, July 15, 1893.

Contract price—		
Lot No. 1—13,300 bbls., at $2 40	$31,920 00	
Lot No. 2—13,300 bbls., at $2 40	31,920 00	
Lot No. 3—13,300 bbls., at $2 45	32,585 00	
		$96,425 00
Paid prior to June 30, 1894	$47,880 00	
Paid September 6, 1894	24,438 75	
Paid December 13, 1894	7,980 00	
Paid September 26, 1895	16,126 25	
		$96,425 00

Car Ferry Slip No. 2, Lombard-Street Wharf. B. McMahon & Son, contractors. Date of contract, March 6, 1894.

Contract price		$23,975 00
Paid prior to June 30, 1894	$16,183 12	
Paid July 6, 1894	7,791 88	
		$23,975 00

Alterations and additions to engines of tug "Gov. Irwin." Date of contract, May 23, 1894. William Deacon, contractor.

Contract price		$3,985 00
Paid July 19, 1894	$2,241 56	
Paid December 11, 1894	1,743 44	
		$3,985 00

Constructing new boilers for tug "Gov. Irwin." Date of contract, May 25, 1894. Moynihan & Aitken, contractors.

Contract price		$4,650 00
Additions to contract—		
Enlarging head and stay bolts	$400 00	
81 extra bolts, 2-in. diameter	66 00	
21 ft. new smokestack	75 00	
		541 00
		$5,191 00
Paid August 16, 1894	$2,840 62	
Paid December 6, 1894	2,350 38	
		$5,191 00

CONSTRUCTION ACCOUNT No. 2.

WORK CONTRACTED FOR AND COMPLETED WITHIN THE YEARS JUNE 30, 1894, TO JULY 1, 1896.

Repairing Folsom-Street Pier No. 2. Date of contract, August 2, 1894. Darby Laydon & Co., contractors.

Contract price		$5,372 00
Paid September 6, 1894	$1,665 00	
Paid September 27, 1894	3,707 00	
		$5,372 00

Paving East Street. Date of contract, November 13, 1894. City Street Improvement Co., contractors.

Contract price: New paving, 16⅜ cents per square foot; relaying old blocks, 3⅜ cents per square foot; gutters, $1 40 per linear foot; cesspools, $66 each; bituminous paving, 13⅞ cents per square foot.

New stone paving—3,750 square feet, at 16⅜ cents per square foot	$614 06	
Relaying stone paving—16,010 square feet, at 3⅜ cents per square foot	540 34	
Stone-curbing and gutters—245 linear feet, at $1 40	343 00	
Drains and cesspools—5, at $66	330 00	
Bituminous rock paving—17,458 square feet, at 13⅞ cents per square foot	2,422 29	
Crossing and patching (as per agreement)—1,820 square feet, at 15 cents per square foot	273 00	
Stone crossing (as per agreement)—138 linear feet, at 60 cents per linear foot	82 80	
Relaying stone crossing—123 linear feet, at 10 cents per linear foot	12 30	
Paving seawall lot No. 8 with cobbles (as per agreement)—20,237 square feet, at 8 cents	1,618 96	
		$6,236 75
Paid December 20, 1894	$2,250 00	
Paid February 4, 1895	2,367 79	
Paid March 7, 1895	1,618 96	
		$6,236 75

Hydraulic hoist for Ferry Slip No. 6. Date of contract, November 13, 1894. Atlas Iron Works, contractors.

Contract price		$1,650 00
Paid December 11, 1894	$1,237 50	
Paid January 17, 1895	412 50	
		$1,650 00

Freight shed, fence, and gate on Seawall Lot No. 8. Date of contract, November 23, 1894. F. A. Williams, contractor.

Contract price		$4,293 00
Paid December 27, 1894	$2,897 77	
Paid January 12, 1895	1,395 23	
		$4,293 00

Bituminous paving, ferry foundation. Date of contract, December 6, 1894. Pacific Paving Co., contractors.

Contract price: 7¾ cents per square foot. The area paved was 31,455 square feet, at 7¾ cents per square foot		$2,437 76
Paid February 19, 1895		2,437 76

Rebuilding Fremont-Street Pier and constructing dry dock slips. Date of contract, December 20, 1894. Darby Laydon & Co., contractors.

Contract price		$7,700 00
Addition to contract	$1,200 00	
Addition to contract	2,587 81	
		$3,787 81
		$11,487 81
Paid February 5, 1895	$4,076 25	
Paid March 5, 1895	1,443 75	
Paid April 4, 1895	5,967 81	
		$11,487 81

Repairing dry dock slips, Spear Street. Date of contract, December 20, 1894. Darby Laydon & Co., contractors.

Contract price	$4,573 00	
Addition to contract	5,369 76	
		$9,942 76
Paid February 5, 1895	$1,371 90	
Paid March 5, 1895	1,714 87	
Paid March 26, 1895	6,855 99	
		$9,942 76

Rebuilding Car Ferry Slip No. 1. Date of contract, January 22, 1895. Randell Hunt, contractor.

Contract price		$8,890 00
Paid February 26, 1895	$2,832 00	
Paid April 30, 1895	2,889 25	
Paid March 26, 1895	3,168 75	
		$8,890 00

Repiling Broadway Wharf No. 1, Clay-Street Wharf, and Ferry Slip No. 7. Date of contract, April 23, 1895. Healy, Tibbitts & Co., contractors.

Contract price: Standard piles under sheds, $3 35 each; standard piles outside sheds, $1 87 each; brace piles, $5 90 each.

Constructing hydraulic hoist for Ferry Slip No. 2. Date of contract, August 22, 1895. Atlas Iron Works, contractors.

Contract price		$1,740 00
Paid September 12, 1895	$1,218 00	
Paid December 13, 1895	522 00	
		$1,740 00

Constructing four sheds at Ferry Slips 5 and 6. Date of contract, September 12, 1895. Thomson Bridge Co., contractors.

Contract price	$1,670 00	
Addition to contract	622 50	
		$2,292 50
Paid October 10, 1895		2,292 50

Constructing storehouse. Date of contract, September 12, 1895. Thomas Day & Son, contractors.

Contract price	$550 00
Paid October 2, 1895	550 00

Constructing shed at Pier 1, Clay Street. Date of contract, September 17, 1895. Healy, Tibbitts & Co., contractors.

Contract price	$1,393 00	
Deduction from contract	10 00	
		$1,383 00
Paid November 12, 1895		1,383 00

Constructing water tank for Dredger No. 1. Date of contract, September 24, 1895. John Twigg & Sons, contractors.

Contract price	$1,075 00	
Addition to contract	121 70	
		$1,196 70
Paid October 19, 1895		1,196 70

Paving with bituminous rock in front of Slips 2, 3, and 4. Date of contract, October 8, 1895. City Street Improvement Co., contractors.

Contract price, 7⅞ cents per square foot. The area paved was 16,769 square feet, at 7⅞ cents	$1,320 56
Paid October 17, 1895	1,320 56

Removing and constructing Pier No. 7, Pacific-Street Wharf. Date of contract, July 30, 1895. San Francisco Bridge Company, contractors.

Contract price	$37,449 00	
Additions to contract	529 50	
		$37,978 50
Paid December 3, 1895	$5,279 25	
Paid January 2, 1896	6,660 00	
Paid February 4, 1896	5,610 00	
Paid March 5, 1896	3,969 00	
Paid April 6, 1896	16,460 25	
		$37,978 50

Constructing houses over aprons to Ferry Slips 2, 3, 4, 5, and 6. Date of contract, October 31, 1895. Thomas H. Soule, contractor.

Contract price	$5,540 00	
Addition to contract (houses over Slips 3 and 4)	3,558 00	
		$9,098 00
Paid December 3, 1895	$1,662 00	
Paid January 2, 1896	3,878 00	
Paid January 28, 1896	1,734 52	
Paid February 18, 1896	1,823 48	
		$9,098 00

Iron work for hydraulic hoist and apron at Ferry Slip No. 5. Date of contract, November 19, 1895. Fulton Engineering and Ship Building Works, contractors.

Contract price		$1,240 00
Paid January 2, 1896	$744 00	
Paid February 6, 1896	496 00	
		$1,240 00

Removing the outer portion of Pier No. 51 (Powell Street) and rebuilding Pier No. 8 (Howard No. 2). Date of contract, January 9, 1896. Cotton Bros. & Co., contractors.

Contract price	$3,734 00	
Addition to contract	250 81	
		$3,984 81
Paid February 27, 1896	$2,179 50	
Paid March 17, 1896	1,805 31	
		$3,984 81

Repairing and rebuilding dolphins at Slips 4, 5, and 6. Date of contract, February 11, 1896. B. McMahon, contractor.

Contract price	$2,100 00	
Addition to contract	403 17	
		$2,503 17
Paid March 24, 1896		2,503 17

Constructing portions of ferry slips at foot of Market Street. Date of contract, August 20, 1895. James A. McMahon, contractor.

Contract price		$7,775 00
Paid October 1, 1895	$1,049 62	
Paid January 2, 1896	3,015 00	
Paid February 3, 1896	3,710 38	
		$7,775 00

Repiling Broadway No. 1.

163 standards under shed, at $3 35	$546 05	
118 standards outside shed, at $1 87	220 66	
		$766 71
Paid June 11, 1895		766 71

Repiling Clay-Street Wharf.

234 standards under shed, at $3 35	$783 90	
115 standards outside shed, at $1 87	215 05	
34 braces, at $5 90	200 60	
30 fenders, at $5 50 (as per agreement)	165 00	
		$1,364 55
Paid May 23, 1895		1,364 55

Repiling Ferry Slip, No. 7.

136 standards outside of shed, at $1 87	$254 32	
29 standards under shed, at $3 35	97 15	
4 standards under office building, at $5 (as per agree't)	20 00	
3 standards at apron (night w'k), at $7 50 (as per agree't)	22 50	
Additional work under tower (as per agreement)	40 00	
		$433 97
Paid July 10, 1895		433 97

Dredging Channel Street. Date of contract, April 30, 1895. San Francisco Bridge Co., contractors.

Contract price: 10 cents per cubic yard.

The quantities dredged are as follows:

Between east line of Third and west line of Fourth Street	12,537 yds.	
Between east line of Fourth and west line of Fifth Street	20,733 yds.	
In front of lot No. 34	1,178 yds.	
	34,448 yds., at 10 cents	$3,444 80
Paid June 20, 1895		3,444 80

Rebuilding Steuart, Spear, and Howard Nos. 1 and 3, wharves. Date of contract, May 9, 1895. Darby Laydon & Co., contractors.

Contract price: Standard piles under shed, $2 37½ each;
Standard piles outside shed, $1 37½ each.

Standard piles outside Howard No. 1	134	
Standard piles outside Howard No. 3	267	
	401, at $1 37½	$551 38
Paid July 23, 1895		551 38

Steuart-Street Wharf, and bulkhead between Steuart and Spear Streets.

150 standard piles under shed, at $2 37½ per pile	$356 25	
105 standard piles outside shed, at $1 37½ per pile	144 38	
		$500 63
Paid July 25, 1895		500 63

Coal platform on Seawall Lot No. 11. Date of contract, May 23, 1895. Darby Laydon & Co., contractors.

Contract price	$1,027 00
Paid June 11, 1895	1,027 00

Hydraulic hoist at Ferry Slip No. 3. Date of contract, April 26, 1895. Vulcan Iron Works, contractors.

Contract price		$1,824 00
Paid May 23, 1895	$1,094 40	
Paid June 17, 1895	729 60	
		$1,824 00

Boathouse for Naval Battalion, Howard-Street Wharf No. 3. Date of contract, July 10, 1895. Alexander L. Campbell, contractor.

Contract price	$973 00	
Addition to contract	27 00	
		$1,000 00
Paid July 26, 1895	$900 00	
Paid August 7, 1895	100 00	
		$1,000 00

Removing and rebuilding outer portion of Folsom No. 2. Date of contract, July 16, 1895. James A. McMahon, contractor.

Contract price		$1,648 00
Paid August 13, 1895	$865 20	
Paid August 27, 1895	782 80	
		$1,648 00

Constructing portions of ferry slips at foot of Market Street. Date of contract, August 20, 1895. James A. McMahon, contractor.

Contract price		$7,775 00
Paid October 1, 1895	$1,049 62	
Paid January 2, 1896	3,015 00	
Paid February 3, 1896	3,710 38	
		$7,775 00

CONSTRUCTION ACCOUNT No. 3.

WORK CONTRACTED FOR SINCE JUNE 30, 1894, BUT NOT YET COMPLETED.

Constructing shed on Pier No. 7, Pacific-Street Wharf. Date of contract, March 10, 1896. Healy, Tibbitts & Co., contractors.

Contract price	$7,893 00
Paid June 25, 1896	4,143 82

Constructing shed on Pier No. 8, Howard-Street Wharf No. 2. Date of contract, March 31, 1896. Galloway, Townley & Co., contractors.

Contract price		$2,654 00
Paid May 13, 1896	$1,580 40	
Paid May 23, 1896	296 33	
Paid June 5, 1896	617 27	
		$2,494 00

Alterations and repairs to machinery of tug "Gov. Irwin." Date of contract, April 28, 1896. Main-Street Iron Works, contractors.

Contract price	$2,700 00
Paid June 3, 1896	1,500 00

Removing and rebuilding Pier No. 12 (Folsom-Street Wharf No. 1). Date of contract, June 2, 1896. James A. McMahon, contractor.

Contract price	$37,769 00

Repairing and rebuilding Bryant-Street Wharf, between Main and Spear Streets. Date of contract, June 9, 1896. Galloway, Townley & Co., contractors.

Contract price:
- $6 00 per pile driven and fastened.
- $14 75 per 1,000 ft. (B. M.) new lumber furnished and laid.
- 50 cents per 1,000 ft. (B. M.) old lumber laid.

Constructing post office building foot of Market Street. Date of contract, June 9, 1896. Healy, Tibbitts & Co., contractors.

Contract price	$4,938 00

Hydraulic hoist at Ferry Slip No. 1. Date of contract, June 18, 1896. Atlas Iron Works, contractors.

Contract price $1,638 00

Building for Spring Valley Water Co. Date of contract, June 18, 1896. Alexander L. Campbell, contractor.

Contract price $543 00

Repiling and repairing Ferry Slip No. 1. Date of contract, June 23, 1896. Healy, Tibbitts & Co., contractors.

Contract price $4,273 00

Repairs to Dredger No. 2 and water-tank. Contract awarded June 30, 1896. John Twigg & Sons, contractors.

Contract price $1,543 00

CONSTRUCTION ACCOUNT No. 4.

SEAWALL.

It has been impossible to make any extension to the seawall during the past two years. The cost of the construction of the approaches to Ferry Slips 2, 3, 4, 5, and 6, on which the Union Depot and Ferry-House is now being erected, and the entire rebuilding of old wharves in a more substantial manner than has heretofore been attempted, but at greater expense, has depleted the San Francisco Harbor Improvement Fund. The policy adopted by the Board, of making all repairs to wharves, etc., of a more enduring character, has prevented accumulations of funds which could be spared for seawall construction. Another factor has been the transference, monthly, of the sum of $4,631 from the San Francisco Harbor Improvement Fund to the San Francisco Depot Sinking Fund. This drain upon the resources, amounting in two years to $111,144, would be about sufficient to complete a section of seawall one thousand feet in length.

The completed seawall has cost as follows:

Section.	Length—Feet.	Cost per Linear Foot.	Total Cost.
Section A, constructed in 1879-80	561	$152 61	$85,614 53
Section 1, constructed in 1878-79	1,000	165 63	165,631 40
Section 2, constructed in 1879-80	1,000	167 50	167,504 09
Section 3, constructed in 1879-81	1,000	235 50	235,049 51
Section 4, constructed in 1880-82	1,000	240 87	240,872 01
Section 5, constructed in 1883-84	1,000	169 89	169,893 57
Section 6, constructed in 1885-86	800	158 47	126,779 73
Section 7, constructed in 1887-89	1,000	109 32	109,327 99
Section 8b, constructed in 1888-90	450	248 50	111,629 12
Section B, constructed in 1890-93	1,000	114 60	114,601 18
Section 8a, constructed in 1891-93	392	219 41	86,008 09
Totals	9,203	Av., $175 26	$1,612,911 22

CONSTRUCTION ACCOUNT No. 5.

Belt Railroad.

Statement of Cost of Construction and Maintenance.

Fiscal Year Ending—	Construction and Equipment.	Maintenance.		Freight Sheds, Coal Platforms, Paving, etc.	Car Ferry Slips at Section 4, Seawall.	Total.
		Employés.	Fuel, Repairs, etc.			
June 30, 1891	$327 61					$327 61
June 30, 1892	74,188 90	$4,769 31	$2,349 25	$24,150 37	$46,503 31	151,961 14
June 30, 1893	4,496 68	8,071 05	3,070 57	72 10		15,710 40
June 30, 1894	50 69	9,621 00	4,971 94	222 70	16,183 12	31,049 45
June 30, 1895	11,587 38	8,857 95	3,434 31	6,875 62	7,791 88	38,547 14
June 30, 1896		10,234 05	4,954 96			15,189 01
Totals	$90,651 26	$41,553 36	$18,781 03	$31,320 79	$70,478 31	$252,784 75

Revenue.

Fiscal Year Ending—	Sale of Rails and Trimmings.	Switching Cars.	Freight Sheds and Car Ferry Slips.	Tolls.	Total.
June 30, 1892		$4,580 75	$8,406 43	$4,493 17	$17,480 35
June 30, 1893		12,039 00	21,600 00	10,019 51	43,658 51
June 30, 1894		10,775 25	21,600 00	8,185 68	40,560 93
June 30, 1895		10,118 75	21,600 00	8,972 13	40,690 88
June 30, 1896	$5,934 25	11,730 00	23,100 00	8,060 69	48,824 94
Totals	$5,934 25	$49,243 75	$96,306 43	$39,731 18	$191,215 61

CONSTRUCTION ACCOUNT No. 6.

Construction of Union Depot and Ferry House.

Masonry work, Union Depot and Ferry House. Date of contract, January 23, 1896. C. F. McCarthy, contractor.

Contract price	$230,000 00

Carpentering, plastering, and glazing, Union Depot and Ferry House. Date of contract, January 23, 1896. Bateman Bros., contractors.

Contract price	$48,400 00
January 25, 1896—To draft	33 00

Plumbing and gasfitting, Union Depot and Ferry House. Date of contract, January 23, 1896. E. James Duffy, contractor.

Contract price	$11,123 00

Painting, Union Depot and Ferry House. Date of contract, January 23, 1896. Geo. J. Smith & Sons, contractors.

Contract price	$12,900 00

Roofing, skylights, and galvanized iron work, Union Depot and Ferry House. Date of contract, January 28, 1896. William Cronan, contractor.

Contract price	$43,599 00

Constructional iron and steel work, Union Depot and Ferry House. Date of contract, March 20, 1896. Risdon Iron and Locomotive Works, contractors.

Contract price		$188,000 00
May 7, 1896—To draft	$3,082 83	
June 2, 1896—To draft	6,481 61	
		$9,564 44

Recapitulation—

Masonry work	$230,000 00
Carpentering and plastering	48,400 00
Plumbing and gasfitting	11,123 00
Painting	12,900 00
Roofing, skylights, and galvanized iron work	43,599 00
Constructional iron and steel work	188,000 00
Total cost of building	$534,022 00

Architect—Union Depot and Ferry House.

Plans and specifications for passenger and ferry depot at the foot of Market Street. Date of contract, October 6, 1892. A. Page Brown, architect-contractor.

Contract price:		
2½% of contract price of foundation—$239,777 60	$5,994 44	
2½% of contract price of cement (used)—$86,181 55	2,154 54	
5% of contract price of superstructure (2½% earned)	12,500 00	
		$20,648 98
Paid prior to June 30, 1894	$11,082 90	
Paid July 19, 1894	6,250 00	
Paid August 2, 1894	187 08	
Paid September 6, 1894	344 27	
Paid October 2, 1894	207 17	
Paid November 1, 1894	480 41	
Paid December 6, 1894	65 47	
Paid January 3, 1895	64 59	
Paid February 5, 1895	84 52	
Paid March 7, 1895	81 02	
Paid April 4, 1895	418 70	
Paid September 18, 1895	236 56	
Paid September 18, 1895	211 12	
Paid September 18, 1895	566 82	
Paid September 18, 1895	174 54	
Paid September 18, 1895	193 81	
		$20,648 98

Twelve thousand five hundred dollars has been paid altogether to architect A. Page Brown on his contract for preparing the plans and specifications for the Union Depot and Ferry House, of which $6,250 was paid prior to June 30, 1894. The estimate was made on a total cost of $500,000 for the structure.

REPAIRS AND PILE-DRIVING.

The large traffic of the commerce of this port, entailing a continuous wear and tear on the wharves and bulkheads, has necessitated the purchase of a vast amount of lumber and the employment of a large number of men on the repair force. The Board has had laid, in places exposed to the greatest wear, a patent-block paving, which seems well adapted to withstand the wear of the heavy teaming to which it is subjected. The driveway on Pacific-Street Wharf (Pier No. 7) has been covered with the same material.

Two pile-drivers have also been kept in constant operation. Nearly all the repair piles that have been used have been either coated with preparations to preserve them from the teredo and limnoria, or with built piles which afford protection. The wharves at present, the Board is glad to be able to say, are in a better condition than ever before in the history of the waterfront.

DREDGING.

It has been found necessary to make extensive repairs to the large dredging-plant owned and operated by the State. A new boiler and engine have been placed in the tug-boat "Gov. Irwin," and the hull thoroughly overhauled and repaired. The dredgers and mud-scows have been repaired so as to keep them in serviceable condition.

Before long it will be necessary to have a dredger constructed to take the place of Dredger No. 1, which has long been superannuated.

Although the operating expenses and repairs have been large, yet the cost of material dredged has only been an average of 11.72 cents per cubic yard. When formerly done by contract the cost had been from 36 to 50 cents per cubic yard, which proves that it is true economy for the State to operate its own plant.

The following table gives a detailed statement of the cost of dredging for each fiscal year since the present system was inaugurated:

STATEMENT OF COST OF DREDGING.

Fiscal Year Ending—	Salary of Employés.	Repairs.	Coal.	Ship Chandlery and Water.	Miscellaneous, including Docking Dredgers, Tugs, and Scows.	Total.	No. Yards Dredged.	No. Hours Worked.	Cost per Cubic Yard. Cents.
June 30, 1875	$11,663 97	$10,362 99	$8,639 00	$1,386 64	$1,301 25	$33,835 71	303,429	2,348¾	10.76
June 30, 1876	11,932 98	7,639 43	8,224 04	1,660 85	1,905 74	31,363 19	342,638	2,634	9.15
June 30, 1877	11,980 99	4,041 44	5,971 71	1,582 10	1,676 79	25,253 03	280,197	2,478½	9.01
June 30, 1878	17,188 80	7,372 48	7,754 86	2,666 37	3,032 55	38,214 40	423,654	3,080	9.02
June 30, 1879	26,201 70	14,963 90	11,755 12	5,443 70	1,289 60	60,454 68	843,879	4,694	7.16
June 30, 1880	27,202 59	8,824 19	11,115 11	4,184 65	318 75	51,645 29	749,011	4,323	6.89
June 30, 1881	25,948 49	10,196 63	11,037 15	4,194 44	85 81	51,462 52	732,919	3,962½	7.02
June 30, 1882	25,860 00	9,556 57	8,925 33	4,101 10	300 45	48,743 45	639,570	3,639½	7.62
June 30, 1883	25,860 01	12,152 06	9,093 05	3,800 58	551 80	51,457 50	635,322	3,776½	8.13
June 30, 1884	26,358 00	20,906 35	9,838 60	3,627 45	50 00	60,780 40	643,100	3,663½	9.45
June 30, 1885	26,896 24	11,610 58	10,074 34	3,657 64	20 00	52,258 80	680,700	3,652½	7.68
June 30, 1886	26,634 65	6,293 18	9,886 55	3,841 02	20 00	46,675 40	678,900	3,758½	6.87
June 30, 1887	26,520 00	36,872 40	7,911 49	4,435 62	2,307 48	78,046 99	601,800	3,175½	12.97
June 30, 1888	27,787 00	10,264 87	11,339 27	4,154 26	537 30	54,082 70	717,600	3,797½	7.52
June 30, 1889	27,847 00	21,004 76	9,392 65	3,292 77	887 78	62,424 96	536,800	3,010	11.62
June 30, 1890	27,825 87	10,403 04	9,377 93	3,671 54	310 53	51,588 91	645,300	3,298	7.99
June 30, 1891	28,112 45	8,919 66	10,163 75	3,735 55	2,299 40	53,230 81	569,300	3,206½	9.35
June 30, 1892	28,151 00	14,121 49	9,545 08	3,736 01	528 12	56,081 70	522,400	3,568	10.73
June 30, 1893	27,655 72	12,858 62	8,596 79	3,533 20	1,362 00	54,006 33	641,400	3,127	8.44
June 30, 1894	28,350 30	17,505 81	8,931 46	3,099 10	471 00	58,357 67	677,200	3,743½	8.75
June 30, 1895	28,516 20	39,226 19	7,959 10	3,683 94	279 00	79,664 43	537,400	2,751	14.823
June 30, 1896	28,493 81	14,132 13	8,713 25	5,208 95	90 88	56,639 02	657,300	3,055	8.617

EXCESS OF MONEY IN SAN FRANCISCO DEPOT SINKING FUND.

Under the provisions of the "San Francisco Depot Act," the State Treasurer is authorized, on the first day of each and every month after the date of the bonds issued for the payment of the money used in the construction of the Union Depot and Ferry House, to take from the San Francisco Harbor Improvement Fund the sum of $4,631 and place the same in the San Francisco Depot Sinking Fund. This is to take place monthly from the date of the bonds, January 1, 1893, and to continue nineteen years, until January 1, 1912. The amount thus transferred would be sufficient to pay both the interest and principal at maturity. The bonds were not sold and delivered until July 1, 1894—eighteen months after their date—and no interest has been or will be paid prior to the latter date. There will be, therefore, at the period of the maturity of the bonds, an excess in the San Francisco Depot Sinking Fund of the amount which would have been paid as interest on the bonds for eighteen months, amounting to $36,000. The bonds were sold at a premium of .01$\frac{3}{16}$, amounting to $7,125. By the provisions of the "San Francisco Depot Act," no more than $600,000 can be expended on the depot. There will be an excess of $7,125 in the San Francisco Depot Fund, and of $43,125 in the combined funds. As the San Francisco Harbor Improvement Fund is in a depleted condition, and, owing to the depressed business condition at present prevailing, the income will be diminished, we would suggest that an Act of the Legislature be passed authorizing the State Treasurer to transfer said excesses in the San Francisco Depot Sinking Fund and San Francisco Depot Fund to the San Francisco Harbor Improvement Fund, immediately. "The San Francisco Depot Act" authorizes such transference from the San Francisco Depot Sinking Fund on the maturity and payment of the bonds.

UNION DEPOT AND FERRY HOUSE.

January 17, 1895, the plans and specifications for the Union Depot and Ferry House, to be located on the foundation of the approaches to Ferry Slips Nos. 2, 3, 4, 5, and 6, on the waterfront of the City and County of San Francisco, were adopted by the Board, and the Secretary was directed to advertise in the San Francisco Chronicle, Call, Examiner, Bulletin, Post, and Report, for twenty days prior to the opening of the bids, for proposals for constructing the same; bids to be opened Monday, February 11, 1895, at 2 P. M.

Subsequently, on January 22, 1895, on account of the omission of publication of one day in one of the newspapers, the resolution of January 17, 1895, in regard to publication for twenty times, was vacated and set aside, and the Secretary was directed to advertise for ten days prior to the opening of the bids in all the above-named papers; bids to be opened February 11, 1895, at 2 P. M.

February 8, 1895, the following resolution was adopted.

Resolved, That the best interests of the State requiring such action on the part of the Board, notice to contractors for proposals or bids for the construction of the Union Depot and Ferry House be and the same is hereby withdrawn, and that any and all bids presented on or before Monday, February 11th, next, be returned by the Secretary to all bidders, unopened.

June 17, 1895, Professor Soulé, of the California University, and Professor Marx, of the Stanford University, who had been employed to examine the foundation of the approaches to Ferry Slips Nos. 2, 3, 4, 5, and 6, on which the Union Depot and Ferry House is to be erected, filed their reports, accompanied by appendices giving calculations in detail of the bearing power of the piling, the load per pile, and a statement in detail of the tests of the material. The conclusions reached were: "First—That the ferry foundations are sufficient in strength and probable durability safely to sustain the weight of the superstructure on which it is proposed, by the adopted plans of the Board, for said superstructure to rest upon them. Second—That the tower of the proposed superstructure, as indicated by the aforesaid adopted plan, will not be a cause of undue strain upon the foundations nor a cause of danger to the entire construction."

September 12, 1895, Percy & Hamilton, architects, who were employed to examine and report upon the plans and specifications prepared by A. Page Brown, for the proposed Union Depot and Ferry House, filed their report. A complete set of the drawings and specifications were furnished them. They reported that, in general, they found the plans of the building very complete, and, in their judgment, well adapted to the objects for which they were designed.

The specifications for the Union Depot and Ferry House having been carefully revised by the Board, and a number of changes made therein before having them printed, the Secretary was instructed, November 7, 1895, to advertise for four weeks in the San Francisco Daily Examiner, San Francisco Wasp, Sacramento Daily Record-Union, and the Los Angeles Daily Times—(those papers, in the opinion of the Board, having the largest circulation in their respective cities)—for proposals for constructing the Union Depot and Ferry House; bids to be opened Tuesday, December 10, 1895, at 2 P. M.

The following bids were received Tuesday, December 10, 1895, and opened in the presence of the respective bidders. The contracts were not awarded until December 24, 1895:

Masonry Work, Including Brick, Stone, Terra Cotta, and Fire-Proofing.

Rae Building and Contracting Co.:

Bid No. 1. Embodying all work and materials described in plans and masonry specifications on the basis of exterior and interior walls, where indicated, faced up with Roman buff brick and terra cotta trimmings, interior grand nave being faced up with white enameled brick to the spring line of the arches, and hollow, flat terra cotta floor arches. (Brick to be as per sample herewith submitted, labeled and marked Bid No. 1.) For the sum of	$257,613 00
Bid No. 2. Embodying all work and materials described in plans and masonry specifications on the basis of using the Roman buff brick and terra cotta trimmings, for facing of exterior walls and first story of interior walls, where specified, and facing up interior of grand nave with white enameled brick and white enameled terra cotta trimmings and hollow, flat terra cotta floor arches. (Brick to be as per samples herewith submitted, labeled and marked Bid No. 2.) For the sum of	$263,923 00
Bid No. 3. Embodying all work and materials described in plans and masonry specifications on the basis of using the red sand-clay mud pressed brick, and red terra cotta trimmings for facing of exterior walls and first story of interior walls, where specified, and facing up the interior of grand nave with white enameled brick and white enameled trimmings, and hollow, flat terra cotta floor arches. (Brick to be as per samples herewith submitted, labeled and marked Bid No. 3.) For the sum of	$256,715 00
Bid No. 4. Embodying all work and materials described in plans and masonry specifications on the basis of using stone (hereafter named) facing for outside of walls and tower in place of Roman buff brick, and facing up interior of grand nave with Roman buff brick and terra cotta trimmings, and white enameled brick up to spring of arches, and hollow, flat terra cotta floor arches. (Brick and stone to be as per samples herewith submitted, labeled and marked Bid No. 4.) Oregon white sandstone. For the sum of	$275,026 00

Price included in above figures for hollow terra cotta tile partitions; no bid per square foot.

Thomas Butler—(same form of proposal):

Bid No. 1	$246,000 00
Bid No. 2	252,248 00
Bid No. 3	234,933 00
Bid No. 4, Colusa sandstone	290,353 00
Redding sandstone	294,353 00
Rochester sandstone	294,353 00
Pioneer sandstone	298,253 00

Hollow terra cotta tile partitions, 22 cents per square foot.

J. H. McKay—(same form of proposal):

Bid No. 1	$268,000 00
Bid No. 2	274,000 00
Bid No. 3	273,000 00
Bid No. 4, Sites sandstone	283,000 00

Hollow terra cotta tile partitions, 22 cents and 14 cents per square foot.

Miller & Beck—(same form of proposal):

Bid No. 1	$246,540 00
Bid No. 2	258,540 00
Bid No. 3	253,540 00

C. F. McCarthy—(same form of proposal):

Bid No. 1	$167,000 00
Bid No. 2	173,000 00
Bid No. 3	168,000 00
Bid No. 4, Nevada stone	218,000 00
Arizona red stone	227,000 00
Oregon gray stone	230,000 00

Hollow terra cotta tile partitions, 12 cents per square foot.

M. McGowan—(same form of proposal):

Bid No. 1	$232,900 00
Bid No. 2	247,000 00
Bid No. 3	239,000 00

Richardson & Gale—(same form of proposal):

Bid No. 1	$242,950 00
Bid No. 2	253,780 00
Bid No. 3	248,390 00
Bid No. 4, Nevada stone	291,657 00
Colusa or Redding stone	296,750 00
Arizona or Rochester stone	299,985 00
Oregon gray stone	303,150 00

Hollow terra cotta tile partitions, 22 cents per square foot.

John McCarthy—(same form of proposal):

Bid No. 1	$233,740 00
Bid No. 2	246,500 00
Bid No. 3	243,250 00

Hollow terra cotta tile partitions, 22 cents per square foot.

Constructional Steel and Cast-Iron Work, and Other Iron Work.

D. P. N. Little	$249,592 00
C. F. McCarthy	199,645 00
San Francisco Bridge Co.	203,863 00
Ralston Iron Works	216,950 00
Risdon Iron and Locomotive Works	188,000 00
Cotton Brothers & Co.	208,000 00
Western Iron Works	209,700 00

Carpenter Work, Plastering, and Glazing.

Cameron & McDonald	$72,000 00
J. H. McKay	51,900 00
F. A. Williams	61,444 00
Campbell & Pettus	59,870 00
C. F. McCarthy	55,300 00
Peter Creichton	66,000 00
Rae Building and Contracting Co.	56,500 00
T. M. McLachlan	64,500 00
Concannon & Shea	57,338 00
T. H. Day	59,500 00
M. C. Lynch	60,870 00
Bateman Bros.	48,400 00
J. W. Wissinger	55,962 00
Alex. L. Campbell	63,727 00

Plumbing and Gasfitting.

H. Williamson	$12,244 00
E. James Duffy	11,123 00
William F. Wilson	11,691 00
C. F. McCarthy	11,500 00
Edward Hogan	12,660 00
Samuel Ickelheimer & Bros.	11,844 00
Dalziel & Moller	12,370 00
W. S. Snook & Son	11,900 00
Shepar & Bros.	14,568 00
J. Doherty	13,900 00

Roofing, Skylights, and Galvanized Iron Work.

McKay & Gross	$69,900 00
C. F. McCarthy	62,000 00
Forderer Cornice Works	57,835 00
Conlin & Roberts	57,900 00
Dalziel & Moller	119,000 00
William Cronan	43,599 00
Bateman Bros.	52,700 00

Painting.

C. F. McCarthy	$16,900 00
George J. Smith & Sons	12,900 00
P. N. Kuss	19,500 00
W. May	16,900 00
J. P. Fraser	16,800 00
L. J. Dwyer	18,885 00
George C. Gottung	34,300 00

The proposals were taken under consideration, the Board taking a recess from time to time in order to verify the figures and thoroughly examine them and the sufficiency of the proposed bondsmen. On December 24, 1895, the contracts were awarded and bonds fixed, as follows:

Masonry Work, Etc.

C. F. McCarthy	$230,000 00
Bond, $115,000.	

Constructional Steel and Cast-Iron Work, Etc.

Risdon Iron and Locomotive Works	188,000 00
Bond, $94,000.	

Carpenter Work, Plastering, and Glazing.

Bateman Bros.	48,400 00
Bond, $24,000.	

Plumbing and Gasfitting.

E. James Duffy	11,123 00
Bond, $5,500.	

Roofing, Skylights, and Galvanized Iron Work.

William Cronan	43,599 00
Bond, $21,500.	

Painting.

Geo. J. Smith & Sons	12,900 00
Bond, $6,500.	
Total aggregate of contracts for Union Depot and Ferry House	$534,022 00

The contracts for heating and lighting have not been let.

Since the inception of the proposed construction of the Union Depot and Ferry House, the Board has been subject to vexatious and annoying litigation which has caused great delay to the construction. Injunctions have been granted at different times, but in every instance the decisions have been in favor of the Board, and their actions uniformly upheld. The latest was the suit of James F. Martin against the Board of State Harbor Commissioners, and C. F. McCarthy, contractor for the masonry work of the Union Depot and Ferry House. This was an action to prevent the Board of State Harbor Commissioners from substituting Colusa sandstone for Oregon gray stone. The contract had been awarded to C. F. McCarthy for Oregon gray stone, and afterward modified, substituting Colusa sandstone at the same price. The latter stone was, in the judgment of the Board and according to scientific physical and chemical tests, preferable because of its superior strength and greater durability. The lowest bid received for furnishing Colusa sandstone was $283,000—$53,000 more than the bid of C. F. McCarthy, which the Board hoped to save the State. The case was before Judge Slack, Department 10, Superior Court, City and County of San Francisco, who, on July 9, 1896, rendered his decision that "the demurrers to the answers are overruled and the order to show cause why an injunction should not issue is discharged." Subsequently, on September 4th, the action was dismissed by Judge Slack and judgment entered in favor of the Board. (For further litigation against this Board see report of attorney, appended.)

A. Page Brown, who, as architect, had prepared the plans and specifications for the Union Depot and Ferry House, having met with an accident which terminated fatally, the Board on February 11, 1896, appointed Edward R. Swain as architect, to carry on the work of construction. Owing partly to litigation, and also to the necessity of having the larger portion of the iron work rolled in the East, very little constructional work had been done prior to July 1, 1896, but since that date the progress made on the work has been satisfactory, and if no untoward event occurs the Union Depot and Ferry House will be completed within one year.

LEASES—"CHINA BASIN"; SEAWALL LOT No. 7.

By an amendment, approved March 26, 1895, to Section 1 of an Act entitled "An Act to amend an Act entitled 'An Act to amend Section 6 of an Act entitled "An Act concerning the waterfront of the City and County of San Francisco," approved March 15, 1878, and to confer further powers upon the Board of State Harbor Commissioners,' approved March 17, 1880," approved March 19, 1889, the Board was authorized to lease seawall lots numbered from one to sixteen, inclusive, for a period not exceeding twenty-five years, for such purposes solely as they may deem most advantageous to the commerce of the port. Also, to lease, for a period not exceeding fifty years, and at a rental not exceeding $1,000 per annum, to any railroad corporation incorporated in this State and not having, at the date of the passage of this Act, any terminal facilities in the City and County of San Francisco, any land belonging to the State, which is required for said purposes, and which lies adjacent or contiguous to any public street or streets designated upon the official map of the City and County of San Francisco.

In pursuance of the powers thus conferred, the Board, in connection with James H. Budd, Governor of the State of California, and Adolph Sutro, Mayor of the City and County of San Francisco, who were constituted ex officio members of the Board for the purposes last above named, met, and after numerous adjournments made for the purpose of considering the proposed lease and protecting the rights of the State, finally, on July 8, 1895, executed a lease to the San Francisco and San Joaquin Valley Railway of the premises known as "China Basin," containing 24¼ acres of land, more or less, for a period of fifty years, at an annual rental of $1,000, payable in advance. Two years' rent has thus far been collected thereon.

August 22, 1895, notice was given in the daily newspapers in the City and County of San Francisco that bids would be received for the letting or leasing of Seawall Lot No. 7, for a term not exceeding twenty-five years, to the highest and best bidder. Two bids were received: one from J. H. Claiborne, Jr., and G. M. Wilde, offering $1,800 per year for the term of twenty-five years, and one from P. B. Cornwall, offering, for the term of fifteen years, $150 per month for the first three years and $200 per month thereafter. The lease was executed to P. B. Cornwall, on the basis of his bid, commencing October 1, 1895.

LITIGATION.

Appended will be found the report of the Attorney of the Board, Mr. Tirey L. Ford, who entered upon his duties April 1, 1895. Since his incumbency a great deal of litigation arising out of the construction of the Union Depot and Ferry House has added to the labors of his position. All of his duties have been performed to the satisfaction of the Board.

E. L. COLNON,
DAN T. COLE,
F. S. CHADBOURNE,
Board of State Harbor Commissioners.

REPORT OF THE CHIEF ENGINEER.

San Francisco, September 12, 1896.

To the Honorable the Board of State Harbor Commissioners:

Gentlemen: I herewith submit to you the following report, showing the general condition of the waterfront:

The foundation of the approaches to Ferry Slips Nos. 2, 3, 4, 5, and 6, which will also serve as foundation for the new Union Depot and Ferry House, was completed September 1, 1895. The same consists of 111 concrete piers of the dimensions of 16 by 28 feet at the base and of 8 feet 6 inches by 28 feet at the top, with depth of 20 feet below city base, and also portion of the concrete seawall in front of Sections 8*a* and 8*b*. These are joined together by a series of groined concrete arches (2 feet in thickness at soffit) into one immense area of floor space 160 feet in width by 670 feet in length. This enormous foundation rests on a subfoundation of grillage supported by over 5,000 piles, each not less than 80 feet in length. 28,000 cubic yards of concrete with 36,000 barrels of cement were required in the construction of the arches and floors. Assuming the weight of concrete to be 4,000 pounds per cubic yard, the total weight of this structure would be 112,000,000 pounds, or 56,000 net tons.

This piece of concrete, pile, and grillage work is undoubtedly one of the largest, if not the largest, of its kind in the world, and required the removal of some 3,000 old and submerged piles, in addition to the concrete, pile, and cement work above mentioned. In the course of its construction some 30,000,000 people passed to and fro over the scene; on an average 150 men were employed continuously for over two years; there was not an accident of any kind whatsoever; and ferry-boats made half-hourly trips from the locality and were not delayed one minute and did not lose a single trip during the whole time. This, I think, is a very creditable showing.

As questions were raised regarding the strength of this foundation and its honesty of construction, Professor Soulé, head of the Department of Civil Engineering of the University of California, and Professor Marx, head of the Department of Civil Engineering of the Leland Stanford Jr. University, were called upon to make a thorough examination and report to the Board. The concrete samples and blocks taken by these gentlemen from four different portions of the foundation, indiscriminately, were, in the case of the poorest, 40%, and in the case of the best, 90%, above the average strength of concrete of that age. These samples sustained a pressure from 90 to 100 tons per square foot. As further proof of the strength of the construction there have been laid 15-ton girders in such position over the arches as to concentrate a load on them which is about one hundred and twenty times greater than any that they could possibly be compelled to sustain in the use for which they were designed.

The original contract price for this work was $247,887, but changes during the course of construction were suggested by me which reduced the above amount $8,109, without impairing the strength or utility of the structure. These changes involved a saving, also, in the amount of cement used, so that in place of 40,000 barrels, as contemplated by the original specifications, only 36,000 barrels were used, thus reducing the cost of the foundation about $17,000.

Another piece of work of considerable magnitude was the reconstruction of Pier No. 7 (Pacific-Street Wharf). This was commenced November 1, 1895, and completed April 1, 1896. This pier, which is the finest of the kind built on this coast, if indeed there is another like it anywhere, rests on 130 cylindrical supports 4 feet in diameter and of an average length of 45 feet. The shell or cylinder proper of each support is $\frac{3}{16}$ inch boiler steel, each inclosing clusters of three piles standing at different heights, the cylinders being then pumped out and filled with concrete. About 900 cubic yards of concrete and 1,500 barrels of cement were used in the work. Between the layers of concrete are strands of old wire cable, with all the tar and grease removed, which tend to tie the concrete together in the same manner as hair in plaster, the whole mass hermetically sealing the piles and preventing dry-rot. The supporting points in this pier being spaced at a distance of 23 feet from centers, over twice as far apart as in ordinary pile piers, the use of heavier timbers and the trussing of the same were necessary. This increasing of the distance of the supporting points is an advantage, however, as there is less impediment to the ebb and flow of the tide, thus decreasing the necessity for dredging, as there is less tendency of the matter in suspension to deposit. This pier is stiffened sidewise by brace piles similar to those used in other piers, but the line of fender piles differs from former construction, in so far as the same is entirely independent of the pier proper, and consists of piles driven 12 inches away from the outside stringer, thoroughly fastened and connected together by two rows of heavy timbers or ribbing, similar to the manner in which the spring-line of the ferry slips is fastened. To keep the line of fender piles in proper position and lessen the shock to vessels lying alongside of the pier, car-springs of special design are placed between the fender and spring-lines of the pier at intervals of about 20 feet.

Pier No. 7 has a length of 600 feet, and is 100 feet wide. A shed 90 feet in width and 575 feet in length was recently completed thereon. There are several novel features in the construction of this shed, namely: that of comparatively indestructible gutters, and the method of hanging the heavy sliding doors in such a manner as to avoid the danger to pedestrians by the falling of the same in case of derailment. The gutters of the sheds as already in use along the waterfront are a constant source of expense, for the reason that they are of such design and construction as to come in contact with the hoisting apparatus of the vessels using the wharf, much to the damagement of the aforesaid gutters. As to the old gates now in use, the danger of derailment has been remedied as well as the details of construction would allow.

The piers or foundation proper of this wharf, as above described, are as impervious to the attacks of the teredo and limnoria as iron and concrete can make them. The surface of the roadway is covered with block pavement, which has been in use on the crossing of Mission-Street Wharf for the past two and one-half years without showing the slightest sign of wear, and on East Street between Market and Mission for a period during which two different layers of bituminous rock pavement failed to withstand the travel. This portion of the waterfront being undoubtedly the most traveled of any street in San Francisco, the aforesaid pavement is guaranteed by the parties laying it for a period of five years.

The contract for Pier No. 12 (Folsom-Street Wharf No. 1) has been let for similar constructions as the above. The only portion of these piers that is in doubt as to its lasting qualities is the lumber used in the superstructure, which is subject to dry-rot, such as the caps and stringers. The Board, profiting by experience of Eastern and European experiments and those of the Southern Pacific Company, carried through a number of years, have arranged for creosoting such lumber and timber of this wharf as are subject to dry-rot, and it will be their policy in the future to build in the aforesaid manner all such new structures as are designed on permanent lines.

The comparative cost of a pier of this character and of one of similar dimensions built in the old manner, is shown below. I take Powell-Street Wharf, which was about the same dimensions as Pier No. 7 before the former was reduced, and the shed on Lombard-Street Wharf (Pier No. 27), the two structures corresponding in magnitude with Pier No. 7 as completed (shed and all). Powell-Street Wharf never had a shed. Taking, then, the cost of construction of Powell-Street Wharf and the shed on Lombard-Street Wharf, as shown by the records, we have the following figures:

Pier No. 51 (Powell-Street Wharf)	$25,210 40	
Coating piles	16,756 56	
Estimated cost of shed on Pier No. 27	10,530 00	
Total		$52,496 96
Cost of Pier No. 7, exclusive of shed	$37,978 50	
Paving center roadway	1,393 50	
Coating piles	4,121 28	
Cement used in piers—1,565 bbls., at $2 45	3,834 25	
Shed	8,293 00	
Total		$55,620 53
Difference in cost		$3,123 57

While the cost of the shed on Pier No. 7 is some $2,200 less than that on Lombard-Street Wharf, it is, nevertheless, a shed of acknowledged superiority. Of course, at the time that Pier No. 51 was built, the cost of lumber and the coating of piles were somewhat in excess of what it is at the present time. It is safe to say, however, that the excess of cost of the cylinder pier wharf, with creosoted superstructure and block-paved roadway, would not be more than 25% of that of the old style protected-pile wharf which it has been the custom to build for the past twenty-five years.

The aprons to all passenger ferry slips are now provided with hydraulic hoists. Not only are these a saving in the matter of expense for repairs, but the element of danger through breakage of the hoisting apparatus, compared with the old-style hand or worm gear, as formerly used, is reduced to a minimum. The saving to the various parties using the slips is obvious, as it is an actual fact that *one* man at the San Francisco termini of the Oakland ferries actually does the work, in regard to raising and lowering these bridges, to accommodate the variations in tide and boats, of *three* men, doing the same work at the Oakland Mole with the old-style hand-hoisting gear. The hoists are provided with automatic safety clutches, which it is impossible to disengage unless the bridge is put in motion; and the cost of water (at Spring Valley rates) for operating said bridges is only 6 cents per day.

The bridges for the freight slips at Lombard Street are also operated by hydraulics, so perfected that it is possible for a child to put in motion some 160 tons of bridge and counter-weight. The cost of water used in operating these bridges is nothing, as it is forced into a supply-tank for the use of the Belt Railroad locomotive after being used in raising and lowering the bridges.

East Street has been raised to the official grade within the past two years, it having settled between two and three feet in places between Broadway and Market Streets, and is at the present time the best paved and cleanest street in San Francisco.

The North Pacific Coast Railroad Company, having constructed a car ferry-boat, necessitated the building of sidetracks and corrals, and a freight warehouse; the latter was constructed on Seawall Lot No. 8, at a cost of $4,293.

The request made by the Chamber of Commerce to extend the Belt Railroad from its present terminus at Vallejo and East Streets to Second and King Streets has not been complied with, for the reason that this extension would cost at least $160,000, and would destroy a great deal of the present landing space, and consequently require the construction of at least two new piers and the purchase of private property. This structure could only be temporary, and would have to be removed as the building of the seawall progressed in a southerly direction. This in itself shows the necessity of continuing the seawall south from its present terminus. There is constant expense devolving upon the Board from the repairs which are necessary along Bryant, Beale, and Main Streets, by reason of the travel to and from the Pacific Mail Company's dock to these localities necessarily coming on the State's property, and all structures in this locality at present are perishable.

In closing, I will call your attention to the fact that the streets, bulkheads, sheds, wharves, etc., are in better condition than they have ever been before in the history of the waterfront.

Respectfully submitted.

HOWARD C. HOLMES,
Chief Engineer.

REPORT OF J. B. HARRIES, EXPERT ACCOUNTANT.

To the Honorable the Board of State Harbor Commissioners:

Gentlemen: In compliance with your request I have examined the books and accounts of the Board of State Harbor Commissioners for the quarter ending June 30, 1896. This, together with previous examinations made by me, covers the two years commencing July 1, 1894, and ending June 30, 1896—the period embraced in your Biennial Report. The few trifling errors or omissions, reported from time to time, have all been rectified, and, finding nothing further in the last examination, I would report the accounting as correct.

BANK AND CASH ACCOUNT.

Balance as per cash book	$18,944 21	
Add tolls not brought to account	303 55	$19,247 76
Balance at bank	$18,228 70	
Checks and coin in safe	1,002 56	
Petty cash account	16 50	$19,247 76

SAN FRANCISCO HARBOR IMPROVEMENT FUND.

Replying to my inquiries, State Controller E. P. Colgan has kindly given me the balance to the credit of this account as it stands on his books:

Balance as per State Controller's books	$62,645 19	
Add remittance by Harbor Commissioners to settle balance of June receipts	22,011 46	$84,476 65
Balance as per ledger of Commissioners	$82,444 93	
Add long standing difference	04	$82,444 97
Difference in excess		$2,031 68

To Controller E. P. Colgan I am indebted for an explanation of this difference. He informs me that drafts Nos. 715, 723, 734, 740, 783, 784, 785, 786, 787, drawn by the Commissioners in favor of A. Page Brown, have not been approved by the Board of Examiners, and consequently remain unpaid.

SAN FRANCISCO DEPOT FUND.

As this account has an important bearing on the general expenditures of the department during the two years covered by the Biennial Report, I give it as it appears on the ledger:

Total amount of bonds	$600,000 00	
Plus amount of premium received	7,125 00	
		$607,125 00
Less drafts drawn by Harbor Commissioners		9,597 44
Balance June 30, 1896		$597,527 56

This balance has been agreed with the books of State Controller Colgan.

SAN FRANCISCO DEPOT SINKING FUND.

This account in the ledger of the Board of State Harbor Commissioners merely shows the amount monthly transferred to it; but, by the courtesy of the State Treasurer, Levi Rackliffe, I am enabled to give the exact position of the fund at the close of business June 30, 1896, as follows:

RECEIPTS.

Monthly transfer of $4,631 from San Francisco Harbor Improvement Fund, as per Act of Legislature—February, 1893, to June, 1896, both inclusive—41 months	$189,871 00
Interest on $70,000 invested in U. S. Registered 4% Bonds of 1907, July 1, 1894, to March 31, 1896	4,900 00
Interest on $50,000 invested in U. S. Registered 4% Bonds of 1925, for quarter ending April 30, 1896	500 00
	$195,271 00

DISBURSEMENTS.

August 23, 1894—Invested in U. S. Registered 4% Bonds of 1907	$70,000 00	
August 23, 1894—Premium paid on same	9,887 50	
September 11, 1894—Expenses in purchasing	250 00	
Interest on $600,000 San Francisco Depot 4% Bonds July 1, 1894, to December 31, 1895	36,000 00	
February 25, 1896—Invested in U. S. 4% Registered Bonds of 1925	50,000 00	
Interest accrued prior to purchase of same	88 90	
Premium on same	6,000 00	
Expenses in purchasing same	53 95	
		$172,280 35
		$22,990 65

BALANCE ON HAND.

In United States Bonds	$120,000 00
Cash balance	22,990 65
Total to the credit of this fund	$142,990 65

The San Francisco Depot Fund bonds were held eighteen months before delivering to the purchasers. The State Treasurer detached coupons Nos. 1, 2, and 3, representing $36,000 in interest, which was saved.

The financial statements, embodied in the Biennial Report, have also been examined by me, and I find them correct in every particular.

As to the books and accounts kept in the offices of the Secretary and Storekeeper, they are what only intelligent and conscientious workers can make them—neat, systematic, correct, and reliable.

In the pursuit of my business as an accountant, I seldom meet with accounts more deserving of the praise which I heartily accord.

JULIAN B. HARRIES,
Accountant.

REPORT OF TIREY L. FORD, ATTORNEY FOR THE BOARD.

To the Honorable the Board of State Harbor Commissioners of the State of California:

GENTLEMEN: The undersigned, the attorney of your Honorable Board, begs leave to submit the following report respecting the affairs of his department:

The undersigned entered upon his duties as attorney for the Board on the 1st day of April, 1895, succeeding Hon. F. S. Stratton. The legal affairs of the Board were found to be in excellent condition, evidencing much labor and care upon the part of your attorney's predecessor.

Immediately upon assuming the duties of his office, your attorney was confronted with the many grave and complicated questions arising out of the preliminary arrangements for the construction of the proposed new ferry house and depot at the foot of Market Street, in the City of San Francisco. Among the more important of these questions were those relating to the authority of the Board to employ an architect; the duties of such architect when employed; the manner of advertising for bids; whether the Board is governed by general State laws or by the provisions of the Political Code relating specially to the Board of State Harbor Commissioners; manner in which payments should be made, and from what fund; authority of Board to change plans or specifications after contracts let; and other questions of like character. Many minor questions were also presented, requiring much time and effort in their proper solution. These questions, many of them involving points of law that were new to the jurisprudence of this State, involved an unusual amount of labor, and are still occupying a large share of your attorney's time. Some of these questions have found their way into the courts, notably those as to what law governs the Board in the construction of the proposed new depot and the right of the Board to make needed changes in the plans and specifications, which questions have been determined by the courts in accordance with the views previously expressed by your attorney.

In addition to the above unusual and special matters there have been the ever present legal controversies that unavoidably attend the large and complicated business of protecting and improving the waterfront of San Francisco, involving, as it does, the construction and preservation of seawalls, piers, wharves, and other structures, the dredging of slips and docks, the collection of tolls, wharfage, and dockage, the letting of many and multifarious contracts, the employment of a large force of employés, and the collection and disbursement of some $600,000 per annum.

Though considerable time has been devoted to the conduct of cases in court and the preparation therefor, by far the greater portion of the work devolving upon your attorney has been that of a counselor rather than that of an advocate. He has attended the meetings of the Board, rendered numerous opinions, both oral and written, made collections without the necessity of suit, drafted contracts, leases, and other papers, when requested to do so, and performed such other duties as pertained to his department.

At the time your attorney assumed the duties of his office, there was pending in the Supreme Court of this State a suit brought by the Union Transportation Company against the Board, to prevent the execution of an order for the removal of plaintiff's vessel from Clay-Street to Mission-Street Wharf, and involving the authority of the Board to cause such removals. Mr. Stratton, your recent attorney, having conducted the case on behalf of the Board in the trial court, was specially employed by the Board to argue the same in the Supreme Court.

In the matter of the lease of China Basin to the San Francisco and San Joaquin Valley Railroad Company, which matter was also pending at the time your attorney assumed the duties of his office, Mr. Stratton was likewise specially employed by the Board.

Excepting in the two instances last referred to, no special or assistant counsel have been employed by the Board during the time covered by this report.

On the other hand, your attorney has, from time to time, been compelled to employ clerical assistance at his own expense in order to properly attend to the increasing duties of his office.

Following is a detailed account of the present status of all litigation in which the Board is interested:

J. W. Taylor vs. *Board of State Harbor Commissioners and J. S. Antonelle.*

This suit, while not yet finally determined, and still nominally pending, need not be further considered, since any possible judgment against the Board would be merely against a certain certificate of deposit issued by the Pacific Bank, and now held by your attorney. (See page 31 of last Biennial Report.)

Union Transportation Company vs. *Charles F. Bassett et al.*

This suit, referred to in a preceding portion of this report, is still pending in the Supreme Court, though the same has been finally submitted, and a decision may be expected at an early day.

Charles F. Bassett et al. vs. *J. M. Wood et al.* (No. 42,555, Superior Court, Dept. 8.)

This suit involves the rights of numerous defendants to the balance due upon a contract with F. J. & J. W. Owens for construction of portion of seawall. The Board is merely a stakeholder, and is ready to pay the money out as the Court may direct. A motion for new trial has recently been denied, and time for appeal therefrom has not yet expired.

Victor Hoffman vs. *Board of State Harbor Commissioners.*

Action to enjoin Board from letting contract for construction of new ferry depot, involving manner in which bids and proposals should be invited. Judgment for defendant, and time for appeal has expired.

People vs. *Allen.* (Three cases.)

Actions pending in the Justice's Court of San Francisco, involving question as to who should pay certain tolls, and also as to amount of tolls to be paid.

E. L. Colnon et al. vs. *Pacific Improvement Company et al.*

Action brought by the Board to recover the south 30 feet of Channel Street, in San Francisco, between Fifth and Sixth Streets.

Involves two important questions: (1) Jurisdiction of Board over Channel Street beyond Fifth Street; (2) Right of Board to recover possession of wharves built by private parties in the territory within the jurisdiction of the Board.

Now pending in the Superior Court, Department 1.

Michael Klein vs. *E. L. Colnon et al.* (Superior Court, Dept. 5.)

Action for damages for personal injuries. Pending in Superior Court.

Harbor Commissioners vs. *Bark "Enoch Talbot."* (U. S. District Court, Northern District of California.)

Libel to recover dockage due. Case settled by payment of full amount demanded.

O. Erickson et al. vs. *E. L. Colnon et al.* (Superior Court, Dept. 5.)

Action for damages for personal injuries to defendant Agnes Erickson, wife of defendant O. Erickson. Pending in Superior Court.

Martin vs. *Board of State Harbor Commissioners et al.* (Superior Court, Dept. 7.)

Suit brought to enjoin the Board from substituting another building-stone for the one named in the bid of the successful bidder in the matter of stone work for the new ferry depot building.

On demurrer to defendant's answer, the Court decided that the Board had such authority, provided the change did not involve any increased expenditure exceeding $3,000 above the amount named in the contract, let in pursuance of the bid referred to.

This case has been set for trial upon the merits on the 25th day of the present month (August, 1896).

Respectfully submitted.

TIREY L. FORD,
Attorney for the Board.

BIENNIAL REPORT

OF THE

BOARD OF STATE HARBOR COMMISSIONERS

FOR THE

BAY OF SAN DIEGO.

SEPTEMBER 30, 1896.

SACRAMENTO:
A. J. JOHNSTON, : : : : : : SUPERINTENDENT STATE PRINTING.
1896.

REPORT.

To Hon. James H. Budd, *Governor of the State of California:*

In accordance with the provisions of Section 2592 of the Political Code, the Board of State Harbor Commissioners for the Bay of San Diego respectfully submit the following report for the period of two years, commencing October 1, 1894, and ending September 30, 1896:

RECEIPTS.

1895—Oct. 29—From rent of tide lands	$112 00
Nov. 26—From rent of tide lands	12 00
Dec. 21—From rent of tide lands	4 00
1896—June 3—From rent of tide lands	24 00
July 20—From rent of tide lands	4 00
Aug. 25—From rent of tide lands	8 00
Total	$164 00

DISBURSEMENTS.

1895—Nov. 20—Expense Attorney attending Supreme Court	$50 00
1896—April 6—Moving office furniture	75
May 26—Office rent, April	15 00
July 15—Printing	7 00
July 24—Office supplies	1 60
July 28—Office supplies	3 50
July 28—Office rent, May, June, July	45 00
Aug. 1—Launch, inspect bay	6 00
Aug. 25—Office rent, August	15 00
Sept. 30—Balance on hand	20 15
Total	$164 00

Nearly all of the tide lands adjacent to the Bay of San Diego, over which the Board is supposed to exercise control, are claimed by private parties. This property is rapidly increasing in value. Every year new complications are arising from this disputed ownership. Therefore, the

Board anxiously await the decision of the Supreme Court, which we trust will be rendered before the convening of the next coming session of the State Legislature.

Respectfully submitted.

D. C. REED,
N. H. CONKLIN,
F. H. DIXON,
Commissioners.

SAN DIEGO, CAL., September 30, 1896.

REPORT OF D. L. WITHINGTON, ATTORNEY.

San Diego, Cal., October 16, 1896.

To the Honorable State Board of Harbor Commissioners for the Bay of San Diego:

Gentlemen: I have the honor to submit the following report of the legal matters which have been committed to my charge, and the condition of the pending action in which the Board is interested:

The case of *Klauber* vs. *Higgins*, which involves substantially all the property of the State committed to the charge of the Board in its decision, has not yet been decided. In August, 1895, I went to San Francisco, where the cases were set for argument with the Oakland cases, having been continued, against our strenuous protest, from the April term in Los Angeles. At that time the Oakland cases were continued by agreement of counsel, and the Court continued the case of *Klauber* vs. *Higgins* till the October term in Los Angeles, at which time I was present and secured the submission of the case; but in June of the present year the Court ordered the case to be resubmitted with the Oakland cases upon the San Francisco calendar, and such submission was had, and a decision is hoped for before the incoming Legislature meets.

The cases of *People* vs. *Higgins*, two in number, are still pending, and I would advise their dismissal, with a view of bringing new actions should the rights of the Board be affirmed in the case pending in the Supreme Court.

I need not refer to the minor matters which have been submitted by your Honorable Board to this office, which have all been disposed of.

Very respecfully yours,

DAVID L. WITHINGTON,

Attorney for State Board of Harbor Commissioners for Bay of San Diego. N.P aty

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